Summary of ACD responses to Division deficiencies

R645-301-121.200,
Energy Laboratories sample ID "B07110148-009" for Client Sample ID "Box 13 CH 5 Below Coal" does not match the client ID listed in the sample identification table for "Box 13 CH 5 Below Coal." A similar circumstance occurs with Energy Labs sample ID "B07110148-010" for Client Sample ID "CH-03, Above Underburden". [PB]

- Changes were made to the sample identification table in Appendix 6-2 to provide laboratory sample identification numbers for all samples analyzed.

The application states in Section 727 that well Y-61 has a borehole diameter of 8.625 feet; this must be corrected

.

- The incorrect statement was removed from the application.

The applicant states that as ground water migrates through the shallow, fine-grained alluvial sediments in the proposed Coal Hollow Mine permit and adjacent area (most notably in Sink Valley), the quality of the water are naturally degraded: Appendix 7-1 is referenced for this information. The application needs a map or drawing that uses Stiff diagrams or some similar representation that will clearly show this degradation.

- Text describing the natural down-gradient degradation of alluvial groundwaters in Sink Valley was added to the section. Drawing 7-5, which shows this degradation using specific conductance values plots was added to the permit application and referenced.

The surface-water baseline discrepancies between Section 724.200, Drawing 7-2, Table 7-5, and the Division's database, as outlined in the following table, need to be resolved. [JS]

Baseline Monitoring Sites	Described in Section 724.200	Listed in Table 7-5	Shown on Drawing 7-2	Data in Database
SW-1	√		√	√
SW-7	√		√	√
SW-10			√	√
SW-18			√	
BLM-1		√	√	√
Lamb Canal			√	√

- Surface-water baseline monitoring sites SW-10, BLM-1, and Lamb Canal were added to the description in Section 724.200.

- Site SW-18 is a monitoring location on an ephemeral wash (Coal Hollow) located more than a mile west of the permit area. Discharge has not been observed there during monitored activities. It is not being included as a baseline monitoring site for this application. SW-18 is not a proposed operational monitoring site and so it is not included in Table 7-5.

R645-301-521

The Applicant must change the term project area to permit boundary on each map in submittal. The term project area is not defined in Section R645.100 of the Utah Coal Rules while the term permit boundary is.

- This change has been made on all applicable maps.

R645-301-624, -724

The Applicant needs to show the extent and depth of the proposed pits on the geologic cross sections of Drawings 6-3, 6-7, and 6-8. Also, to more clearly convey the importance of the Sink Valley Fault and associated Tropic Shale ridge in the relationship of the hydrologic systems to the proposed mine, the Applicant needs to show the Sink Valley Fault on several other maps and cross sections, including but not limited to: Drawings 7-1, 7-4, 7-7, 7-12, 5-10, 5-17, 5-18, and 5-19. As an alternative, the Applicant could create new maps and cross sections that clearly show the relationship of the proposed pits to the Sink Valley Fault, the Tropic Shale Ridge, the alluvium, and the springs, wells, and surface water. [JS]

- Cross-sections have been created to show these relationships. Additionally, the approximate locations of the Sink Valley Fault and Tropic Shale ridge have been added to several maps.

R645-301-720

A complete search of the water rights needs to be conducted and submitted in a table that identifies the water right, type of water right, the amount of the right, reported, ownership and status. [DD]

- Alton Coal Development, LLC will continue to research water rights information in the permit and adjacent area. The water rights information provided in the previous submittal was researched and prepared by a water rights professional with over 30 years experience in Utah water rights. ACD will continue to investigate the water rights in the permit and adjacent area. The information provided in Appendix 7-3 and Drawing 7-3 should include all necessary information as requested.

R645-301-722.100

The relationship of the alluvial ground-water table to wells and springs in and adjacent to the NW1/4 of Sec 29 is crucial in understanding the PHC of the proposed mining operation. The applicant must include a series of contour maps or cross section showing the progressive changes in the water table during the pump drawdown test.

- A cross-section showing the progressive drawdowns in the pumping and observation wells during the January 2007 pump test has been provided as Drawing 7-14. This cross-section shows drawdowns in wells C2, Y-102, Y-61, and Y-59. Drawdowns in other wells were mostly very small because of their distances from the pumping well and the low-permeability sediments in which the wells are screened.

The applicant needs to provide maps and cross sections depicting (1) the relationship of water table(s) and potentiometric surface(s) to ground-surface elevations, and (2) seasonal variations in head in the various aquifers. [JS]

- Two new figures were added to Appendix 7-7. Figure 13 shows plots of average depth to groundwater below the ground surface in the permit and adjacent area, and Figure 14 shows plots of seasonal variation in alluvial groundwaters in the permit and adjacent area.

R645-301-722.300

The Applicant needs to clarify the difference between the bore holes shown on Drawing 7-2 and those on Drawing 7-12 and why some are considered sources for baseline information while others are not.

This need for clarification also applies to the narrative for this section and Section 724.100.

The difference between the bore holes and wells in Tables 7-1 and 7-2 needs to be clarified. [JS]

- A new version of Drawing 7-2 is being submitted. No boreholes are included on this drawing and the legend has been revised.
- A new version of Drawing 7-12 is being submitted. No boreholes are included on this drawing and the legend has been revised.
- No borehole information is included in either of these drawings. Some confusion may have arisen because of the incorrect legend notation showing the wells as "Drill Holes". Additionally,

the locations of some old Utah International monitoring wells in the surrounding areas that were not utilized here were removed from the maps.

- No text clarifications are needed now because is should be clear that only wells are considered sources for baseline information and included on these drawings.

R645-301-722.400

The Applicant must distinguish water wells from other wells and boreholes on Drawings 7-2 and 7-12. [JS]

- The wells shown on Drawings 7-2 and 7-12 are all water monitoring wells. The legends on the maps have been corrected to clarify this. No water production wells are known to be present in the permit and adjacent area. Well Y-61 is a larger diameter well (8.625 inch) constructed for aquifer testing as part of a previous mine planning/permitting operation. There is no pump in the well. Because the well is screened in the coarse-grained artesian alluvial groundwater system, the well free-flows when the valve is opened.

R645-301-724

The application must be consistent when using terms for baseline monitoring and operational monitoring. i.e. discharge and operational laboratory water quality measurement terms; discharge and field water quality measurement terms.

- Corrections and clarifications were made to the monitoring protocols.

Identify who owns the water right on well Y61. If a transfer was recently negotiated, indicate whether it was approved by the Utah Division of Water Rights.

- Well Y-61 is no longer planned for use as a water supply or water replacement well for the Coal Hollow Mine. A new well is planned for construction on land leased by ACD for this purpose. Based on the information presented in Appendix 7-3, ACD is not aware of any valid water right associated with Y-61.

Illustrate on Drawing 7-3 all wells with water rights. [DD]

No wells with water rights are known to exist in the permit and adjacent area.

R645-301-724.100,

The area covered by the seep and spring survey in Appendix 7-1 needs to be shown on a map or otherwise clearly identified. [JS]

- A new spring and seep survey report has been included as a replacement for the previous spring and seep survey included as Appendix B to Appendix 7-1. This new report includes descriptions of data collection techniques and includes a delineation of the area covered by the spring and seep survey.

Mining in the lower part of Section 30 will destroy wells Y-102, C2, C7, C8, and C9 that lie within the Sink Valley groundwater trough. Groundwater monitoring should be established in the lower part of sink valley to establish water quality changes during operational and reclamation phases.

- Text describing the groundwater monitoring plan for the southern portion of Sink Valley for the operational and reclamation phases was included. To enhance groundwater quality monitoring in the southern Sink Valley area, the plan was modified to include operational laboratory water quality monitoring at well LS-28.
- Well Y-102 is not within the proposed mining area and will not be destroyed by mining operations.

Consolidate well information into a table so it can be more readily accessed. In the well table show all wells noting which are in the database and which are in Appendix 7-1; show which ones are monitored; show which ones have water rights; show ownership; show collar elevation; show ground elevation; show depth to water from ground; show elevation of water; state which map a well is located on; state how the wells are monitored (i.e. field parameters, quality parameters, elevation).

- As requested, a new well information summary table (Table 10) has been included in this permit application.

Consolidate spring information into a table so it can be more readily accessed. In the spring table show all springs; indicate which are monitored; indicate which have water rights; indicate ownership; indicate flow range; state which map a spring is located on; state how the springs are monitored (i.e. field parameters, quality parameters, flow).

- As requested, a new spring information summary table (Table 11) has been included in this permit application.

Explain the negative values submitted to the DOGM water quality database for well Y61.

- Text describing the negative values submitted to the DOGM water quality database for Y-61 and other flowing artesian wells has been included.

Describe how the piezometric surface was derived with a paucity of well data on the west and north side of the permit.

- Text clarifying the derivation of the water level contour map has been included in the permit application.

Show the seasonal variation of ground water on a map for the entire permit area and adjacent area. [DD]

- Seasonal variation of groundwater is shown on Figure 14 in Appendix 7-7. Depth to water below ground surface information is shown on Figure 13 of Appendix 7-7.

R645-301-724.500

The applicant notes that after the pump on Y-61 was stopped at the end of the 28-hour pumping test, spring discharge rates and water levels in alluvial monitoring wells recovered to approximate pre-test levels: the data in Appendix 7-1 do not show this, the measurements ending after only 30 hours for SP-20 and SP-14, 29 hours for C3-40, 28 hours for C2-40, and not even running to the end of the pumping period for SP-8, C4-30, and SS-30. The applicant needs to provide the data for the complete recovery period, or at least include the next quarterly measurement to show the approximate extent of recovery. [JS]

- Information in Appendix 7-1 has been updated to show later recovery data. Additional information on well recovery levels has been submitted to the Divisions EDI database.

R645-301-727

The application must include a copy of the written agreement with Richard and Alecia Dame that allows access to well Y-61 on the Dames property.

- Alton Coal Development, LLC no longer plans to enter an agreement with the Sorensen's for access to Y-61. As stated in the permit application, current plans are to construct a new water well for mining and potential water replacement use on lands leased by ACD.

The application must include a copy of the agreement with the town of Alton to transfer the point of diversion for 50 acre-feet of water for the Applicant's use to Y-61. [JS]

- The agreement is included in Appendix 7-8 (confidential binder).

R645-301-728.310

The applicant has not submitted sufficient information to show the hydrologic balance will be maintained. Geologic information identifies a hydrologic barrier between the Sink Valley aquifer and the proposed mine pit. Information presented in the Petersen Hydrologic Report Figures 6d, 6e, and 6f shows the level of groundwater at different monitoring sites in Sink Valley. Mining of the pit will remove some of the barrier that contains the groundwater in Sink Valley. Extending the cross-sections westward to include the mine pit will allow the reviewer to see the reduction of the hydrologic barrier and potential change of the groundwater level. The applicant shall supply cross-sections that depict the relationship between the mine pit and Sink Valley trough, and show the expected change in the groundwater head as a result of mining. [DD]

- New cross sections are included in this permit application. A discussion of these issues is included in the text.

R645-301-728.332, -121.200

The Applicant needs to identify where in the application the following can be found (in reference to the PHC):

geochemical data that indicate the potential for AMD and toxic drainage is low, and an analysis or discussion of the data. [JS]

- New text describing the AMD and toxic drainage potential at the Coal Hollow Mine has been added to the permit application in this section.

R645-301-728.333

Flooding of pit mines by heavy precipitation is a known occurrence at open cast mines and a real possibility at the Coal Hollow Mine. The mine does not anticipate water entering the pit from adjacent strata, but this may prove to be incorrect. The mine needs a plan for pumping and disposing of water from the pit.

- Contingency plans and preventative measures to be employed have been described and appropriate text added.

The application needs to quantify the rate - at a minimum provide a reasonable worst-case estimate - at which alluvial ground water could drain into the mine pits: whether or not removing such water from the pit can potentially cause flooding or stream flow alteration has not been and cannot be analyzed without such information.

- A discussion of likely ranges of alluvial groundwater inflow rates and worst-case mine inflow scenarios has been added to the text as appropriate. A discussion of a special mining protocol that will be employed when mining occurs in pits 13-15 has been developed and described in the text.

The applicant needs to provide a basis for the supposition that land management practices in the late 1800s or early 1900s are the reason for the instability of the principle surface drainages in and adjacent to the proposed mine area. The application needs to discuss the potential impact of the Coal Hollow Mine on this instability.

- A discussion of mechanisms potentially responsible for the existing stream drainage instability and a discussion of potential mine impacts on this instability has been added to the permit application.

The applicant states in Section 728.333 that lower Sink Valley Wash has a large discharge capacity and conveys large volumes of runoff periodically, yet the applicant asserts in the AVF section that Sink Valley Wash is not a continuous channel. The applicant needs to clarify and rectify this apparent incongruity.

- The previous statement was unclear, because the drainage was referred to only as lower Sink Valley Wash. This statement was clarified to mean the Sink Valley Wash stream channel below the County Road 136 crossing.

The application needs to quantify the statement that most precipitation waters falling on disturbed areas will be contained in diversion ditches and routed to sediment impoundments that are designed to impound seasonal water and storms. How much water will not be contained in these structures, and what happens to water not entering diversions and ponds?

- Text describing surface runoff and sediment control measures for these areas has been incorporated into the text.

The application states (Sec 728.334) that irrigation has not occurred during the past 10 years: the applicant needs to provide a basis for this statement. [JS]

- A reference to personal communication with the pertinent landowners has been included in the text.

R645-301-728.334

The application needs to quantify the potential decreases in alluvial discharge in Area A (that are anticipated to be short lived). There is no quantification or discussion of the assertion. What would be the worst-case scenario, and how would the mine deal with it? [JS]

- Appropriate text and discussion has been incorporated into the permit application.

R645-301-731

The springs proposed for operational and reclamation monitoring are not sufficient by Division standards. The Division will require SP-4, SP-6, SP-8, SP-14, SP-20 and SP-33 be monitored for discharge and water quality during operational and reclamation activities. Springs SP-14, SP-16, SP-19, SP-22 and SP-24 should be monitored for discharge and field parameters, as recommended by the applicant. [DD]

- It should be noted that spring SP-19 was removed from the water monitoring plan. This spring discharges at a low rate near the Sorensen ranch house. Conversations with the landowner (Darlynn Sorensen) indicate that most of the water monitored at SP-19 is water that is overflowing from a stock watering trough. Monitoring of flow at this location, consequently, would not be meaningful nor would useful information be provided.

R645-301-731.300

The plan suggests in Section 358.530 that there may be ponds containing hazardous concentrations of acid/toxic forming materials. Please provide a reference to the Sections in the application where further description of the characteristics of the expected hazard can be found. I.e. Does the applicant expect run off from the Tropic Shale to form saline/sodic ponded water? Also, please provide a reference to the Section of the application that describes the plans for identification, storage and burial of the hazard.

- The sampled overburden and underburden materials at the proposed Coal Hollow Mine do not have chemical properties that would likely result in acid- or toxic-forming conditions. Saline/sodic ponded water is not anticipated. Text to this regard has been added to the permit application. Other text has been added as appropriate.

Appendix 6-2 unacceptable levels of selenium in the zone below the coal and in the vicinity of CH-06-05, below 35 ft. where either insufficient sample provides no information on selenium levels or high levels of selenium were recorded. Please explain how overburden below 35 ft represented by CH-06 cores analyses and the zone below the coal will be isolated from groundwater during final reclamation.

- Text describing acid-forming and toxic-forming potential in the overburden and underburden at the proposed Coal Hollow Mine has been added as appropriate.

The plan states overburden will be monitored (Section 232.720) and no poor quality materials will be placed in the upper four feet of reclamation surface (App. 2-1 Section 5, pg. 5-2). The plan must also include a commitment to selectively place overburden having "poor" quality SAR, elevated Selenium, poor pH, and/or unacceptable levels of selenium, boron or acid forming potential, as defined by Division guidelines, to minimize the potential of contamination of ground and surface water. [PB]

- Text describing the potential for contamination of groundwater and surface water through interaction with these materials has been added to the permit application.

R645-301-731.800,
The applicant must provide reclamation designs for the eastern permit boundary where the mining pits meet the undisturbed alluvium. Such designs will specify engineering methods to be used to minimize drainage from the alluvium into the fill in the reclaimed pits, thereby protecting the hydrologic balance in Sink Valley. The applicant should discuss how the pit will be reclaimed to restore the groundwater level in Sink Valley. [JS, DD]

- Text has been added to the permit application as appropriate.

Water rights replacement plans must be further addressed, with regard to the volume of water available from well Y-61. [DD]

- A discussion of the likely adequacy of the proposed new water supply well to provide the potentially required water replacement requirements has been added to the permit application.

R645-301-742.312.1, -553.110, - 742.313, - 742.314
The Division sees no purpose or need for the unnatural and potentially unstable proposed final permanent configuration of Lower Robinson Creek, which furthermore does not meet AOC requirements. The applicant must provide a plan to reclaim Lower Robinson Creek to a more natural and stable configuration, which restores or approximates the premining characteristics of the original stream channel and AOC for the area. Increasing sinuosity above that of the current channel in order to reduce the channel gradient might be considered. [JS]

- Text describing the previously proposed Lower Robinson Creek reconstruction was deleted from the permit application. Language characterizing the new proposed reconstruction was added and references to specific design plans in Chapter 5 were given.

R645-301-742.312.1, - 742.313, - 742.314, -553.110

The Division sees no purpose or need for the unnatural and potentially unstable proposed final permanent configuration of Lower Robinson Creek, which furthermore does not meet AOC requirements. The applicant must provide a plan to reclaim Lower Robinson Creek to a more natural and stable configuration, which restores or approximates the premining characteristics of the original stream channel and AOC for the area. Increasing sinuosity above that of the current channel in order to reduce the channel gradient might be considered. [JS]

- Text describing the previously proposed Lower Robinson Creek reconstruction was deleted from the permit application. Language characterizing the new proposed reconstruction was added and references to specific design plans in Chapter 5 were given.

R645-301-745.120

The Application must provide details on reclamation treatments to prevent water infiltration into the fill. [DD]

- *Appropriate text has been added to the permit application.*

R645-301-748, -755, -765

The plans are clear for the method to close wells deeper than 30 feet, but unclear on closure of shallower wells. The application needs a closure plan that clearly includes all wells and bore holes. [JS]

- A plan for closure of wells and boreholes less than 30 feet deep was added to the permit application.

R645-301-750, -121.200

The applicant needs to clarify and provide design and performance specifications as to how ground water encountered in alluvial sediments along the margins of mine pit areas will be drained in advance of mining and during mining through the use of wells, pumps, pipes, ditches or other conveyance methods that will carry these waters away from mining areas. [JS]

- Added text and made edits providing additional details and clarifications on the potential for handling moderate quantities of groundwater in the mine area and the routing of intercepted groundwater from the mine using ditches, pipes, or other conveyance methods in Section 728.332.

R645-302-321.100

Appendix 7-7 does not include a description of the AVF in the adjacent area. According to the analysis of the information in the appendix an AVF is present to the south and west and possibly east of the proposed disturbed area. Appendix 7-7 should be revised to include information for these areas including at a minimum agricultural production and mapping of the extent of the AVF in Kanab Creek and lower Sink Valley. [DD, JH]

- Additional information regarding alluvial valley floors in the surrounding areas has been provided in Appendix 7-7. This information includes maps delineating probable alluvial valley floors in the Kanab Creek and lower Sink Valley Wash areas. The new information provided in Appendix 7-7 also includes information on agricultural productivity.

R645-302-321.260

Plates 3 and 4 include color infrared aerial imagery taken in July of 2006 and November of 2007. Although the application states that the imagery was used extensively by the researchers in various disciplines, the application needs to include an analysis of the two plates to show late summer and fall differences between upland and valley floor vegetative growth. [JH]

- This issue was discussed and resolved during the October 2008 field visit to the mine permit area.

R301-302-321.230

Maps showing the location of each diversion structure for all lands that are currently or were formerly historically flood irrigated on Kanab Creek and Sink Valley Creeks must include information on the alluvial valley floor west of the proposed permit area on Kanab Creek and south of the proposed permit area in lower Sink Valley. [DD]

- This information is provided in Plate 5 of Appendix 7-7.

R645-302-322.230

The applicant shall address whether the operation will cause or present an unacceptable risk of causing material damage to the quantity or quality of surface or groundwater that supplies the adjacent alluvial valley floor of lower Sink Valley and Kanab Creek. Information to be provided should include the volume of water expected to be intercepted during mining and the volume of water currently used in agriculture along lower Sink Valley and Kanab Creek alluvial valley floors. [DD]

- This new information is provided in Appendix 7-7.

R645-302-323.110

The applicant shall show that the proposed operation would not interrupt discontinue *or preclude farming on an adjacent alluvial floor in lower Sink Valley. [DD]*

- This new information is provided in Appendix 7-7.

Chapter 7 Text Changes

This document provides a description of the changes to the Coal Hollow Mine MRP Chapter 7 text made for the December 2008. Additionally, some simple typographic errors and minor formatting changes were also made which are not noted here.

The entire text of Chapter 7 of the MRP with Table of Contents is being submitted in this submittal. Changes made from the previously submitted version of Chapter 7 have been made as noted below.

Section 721

- Added reference to new Petersen Hydrologic, LLC spring and seep survey report for the Coal Hollow Project area.
- Added information on historic irrigation of lands.
- Added clarification on the bank seepage area in the Lower Robinson Creek drainage and added information on the temporal variations in the seepage locations.
- Added reference to new Drawing 7-5 (plot of specific conductance at spring and seep locations) and provided a discussion of the natural degradation of alluvial groundwater quality as it migrates through Sink Valley.
- Added references to new tables 7-10 and 7-11, which are monitoring station details and summaries for wells and springs.

Section 722.100

- Corrected incorrect references to Drawing 7-13.
- Provided discussion and details regarding the construction of Drawing 7-13.

Section 724.100

- Provided information regarding negative numbers submitted to the EDI system for water levels in wells with flowing artesian conditions and information on monitoring techniques for wells experiencing these conditions.
- Added text to clarify baseline monitoring stations for surface waters.

Section 724.600

- Removed response to non-applicable regulation.

Section 724.700

- Added reference to Appendix 7-7.

Section 727

- Removed text describing the previously planned water replacement source (well Y-61) and discussions of landowner agreements with the landowner at Y-61. Added text describing the planned new water replacement well and its likely suitability for replacement water use including the worst-case scenario for water replacement needs.

- Added a reference to the written agreement with the town of Alton, Utah to transfer the point of diversion for 50 acre-feet of water (included as Appendix 7-8 in the Confidential Binder).

Section 728.310

- Added clarification on alluvial groundwater seepage in the bottom of the Lower Robinson Creek stream channel.
- Added clarification that the C2 monitoring well cluster is located in an area that will be intercepted by the mine workings.
- Added a clarification that coarse-grained alluvial sediments east of the C2 well cluster could possibly be intercepted by mine workings.
- Referenced special mining protocols outlined in Section 728.333 that will be employed to minimize the potential for large mine inflows when mining in pits 13-15.
- Added an additional reference to the special mining protocols to be employed when mining pits 13-15 as discussed in Section 728.333
- Added an analysis and discussion of the potential for changes in hydraulic head when mining through the natural low-permeability barrier separating the eastern alluvial groundwater systems from those to the west.

Section 728.332

- Added additional description and analysis of the acid- and toxic-forming potential of overburden, coal, and underburden.
- Provided additional details and clarifications regarding management of mine dewatering waters.

Section 728.333

- Provided a mining protocol for mining in pits 13-15 that will minimize the potential for interception of large quantities of alluvial groundwater in the mine pits and will minimize the potential for adverse impacts to the hydrologic balance.
- Provided a discussion of unanticipated worst-case scenarios for mine inflows and provided a discussion of how the mine would deal with such an occurrence.
- Provided a discussion of possible mechanisms influencing existing stream instability in the region.
- Provided a discussion of how the proposed mining and reclamation activities will affect conditions in currently unstable stream channels. Also provided a discussion of how mining and reclamation activities will minimize the potential for stream instability and erosion.
- Provided a statement indicating that land-use practices that will occur after final bond release are beyond the control of Alton Coal Development, LLC's.
- Provided a clarification regarding the stream channel capacity in lower Sink Valley Wash.

- Provided information on the potential for stream erosion from potential mine discharge water.
- Provided a discussion of the fate of surface-water runoff that is not routed to sediment ponds and proposed sediment treatments for these waters.

Section 728.334
Provided a discussion of quantification of potential declines in hydraulic head and groundwater discharge from alluvial systems in groundwater discharge Area A. Also a discussion of how potential impacts may be avoided and what the likely duration of impacts may be.

Section 731

- Provided a plan for permanent closure and abandonment of water wells less than 30 feet deep.

Section 731.200

- Added a discussion of groundwater monitoring locations that will remain in the southern portion of Sink Valley during the operational and reclamation phases.
- Modified water-monitoring Table 7-5 with the following changes. For springs SP-14 and SP-16 and for well LS-28 the plan was modified to call for operational laboratory water quality parameters. Spring SP-19 was deleted from the monitoring plan.

Section 731.800

- Provided a discussion of the likely hydrogeologic conditions in backfilled pit areas adjacent to the undisturbed alluvium and a discussion of the probable effects on the hydrologic balance.

Section 733

- This section is updated to include Pond 1B.

Section 734

- This section is updated to include Pond 1B.

Section 735

- This section is updated to include the revised design for the excess spoil pile and also the revised geotechnical analysis provided in Appendix 5-1.

Section 742

- Updates are included for Pond 1B, revised ditch 4, primary roads, temporary Lower Robinson Creek Diversion and the facilities area.

Section 742.323

- Deleted obsolete language regarding the previously proposed Lower Robinson Creek Diversion.
- Added new language describing the Lower Robinson Creek reconstruction.

Section 743

- This section is updated to include Pond 1B.

Section 745

- This section is updated to include the revised design for the excess spoil pile and also the revised geotechnical analysis provided in Appendix 5-1.

Section 746

- Removed responses to non-applicable coal mine waste regulations.

Section 754

- Added statement that coal mine waste is not anticipated.

Section 755

- Provided a plan for permanent closure and abandonment of water wells less than 30 feet deep.

Section 762

- Updated to clarify existence of postmining roads.

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Chapter 7

R645-301-300

HYDROLOGY

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CHAPTER 7

R645-301-700. HYDROLOGY

711. GENERAL REQUIREMENTS

711.100 – 711.500 Contents

This chapter provides a description of the hydrology and hydrogeology of the proposed Coal Hollow Mine permit and adjacent area. Specifically, this permit section includes descriptions of existing hydrologic resources according to R645-301-720, proposed operations and potential impacts to the hydrologic balance according to R645-301-730, methods and calculations utilized to achieve compliance with the hydrologic design criteria and plans according to R645-301-740, applicable hydrologic performance standards according to R645-301-750, and reclamation activities according to R645-301-760.

This information is presented in subsequent sections of this chapter and in Appendix 7-1. Appendix 7-1 includes a comprehensive characterization of groundwater and surface-water systems in the proposed Coal Hollow permit and adjacent areas, recommendations for groundwater and surface-water monitoring, and the results of a field investigation regarding the potential for alluvial valley floors in the proposed Coal Hollow Mine permit and adjacent area. It should be noted that Appendix 7-1 may be updated periodically in the future as additional hydrologic and hydrogeologic data become available.

712 CERTIFICATION

All cross sections, maps, and plans have been prepared per R645-301-512. Compliance with this section has been completed and certifications are available on all Drawings. The cross sections and maps that are included in this permit application and are required to be certified have been prepared by or under the direction of a qualified, registered, professional engineer or a professional geologist, with assistance from experts in related fields such as hydrology, geology and landscape architecture.

713 INSPECTION

Impoundments will be inspected as described under R645-301-514.300. Designs for proposed impoundments in the proposed Coal Hollow permit area are shown in Drawings 5-25 through 5-31 and Appendices A5-1 and A5-2. No impoundments or sedimentation

ponds meeting the size or other qualifying criteria of MSHA, 30 CFR 77.216(a) exist or are planned within the proposed Mine Permit Area.

A professional engineer or specialist experienced in the construction of impoundments will inspect impoundments. Inspections will be made regularly during construction, upon completion of construction, and at least yearly until removal of the structure or release of the performance bond. The qualified registered professional engineer will promptly, after each inspection, provide to the Division, a certified report that the impoundment has been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules. The report will include discussion of any appearances of instability, structural weakness or other hazardous conditions, depth and elevation of any impounded waters, existing storage capacity, any existing or required monitoring procedures and instrumentation and any other aspects of the structure affecting stability. A copy of the report will be retained at or near the mine site.

720 ENVIRONMENTAL DESCRIPTION

721 GENERAL REQUIREMENTS

The existing, pre-mining hydrologic resources within the permit and adjacent areas that may be affected by coal mining and reclamation operations are described in Appendix 7-1 and are summarized below.

Groundwater Resources

A spring and seep survey of the proposed Coal Hollow Mine permit and surrounding area has been conducted by Petersen Hydrologic, LLC (see sub-appendix B of Appendix 7-1). The locations of springs and seeps in the proposed permit and adjacent area are shown on Drawing 7-1. Seasonal discharge and field water quality measurements for springs and seeps in the proposed Coal Hollow Mine permit and adjacent area have been submitted electronically to the Utah Division of Oil, Gas and Mining Utah Coal Mining Water Quality Database (UDOGM, 2007). Baseline discharge and water quality data for groundwater resources in the proposed Coal Hollow Mine permit and adjacent area are have also been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007). Locations of baseline monitoring stations are shown on Drawing 7-2. Locations of water rights in and adjacent to the proposed Coal Hollow Mine permit area are shown on Drawing 7-3. Water rights data from the proposed Coal Hollow Mine permit and adjacent area are detailed in Appendix 7-3. A plot showing potentiometric levels in alluvial groundwater systems in the proposed Coal Hollow Mine permit and adjacent area is presented in Drawing 7-13.

There are no domestic water supply springs or wells in the proposed permit area. However, wells and springs that provide water for domestic and livestock use are located on and adjacent to the proposed permit area (Drawing 7-2). Some lands east of and

adjacent to the proposed Coal Hollow Mine permit area have historically been irrigated using water from alluvial springs. However, irrigation from these springs was apparently limited to home gardens and a few fruit trees. No irrigation of these lands (other than some yard watering at the Swapp Ranch house) is currently occurring nor has it occurred in at least the past 10 years (Personal communication, Burton Pugh, 2008; Richard Dames, 2007). Additionally, limited irrigation of lands occurs east of the proposed Coal Hollow permit area using surface waters derived from runoff from the adjacent Paunsaugunt Plateau area. Irrigation of these lands is largely limited to years with appreciable precipitation and stream runoff (Personal communication, Darlynn Sorensen, 2008).

Groundwater discharge occurs from springs and seeps in the upland areas of the Paunsaugunt Plateau east of the permit area (Tilton, 2001; Appendix 6-3). However, these springs discharge from rock strata that are topographically and stratigraphically up-gradient of and considerable distances from the proposed Coal Hollow Mine permit area. Consequently, groundwater systems in these areas will not be impacted by mining activities and these are not considered further here.

Groundwater resources in the Tropic Shale and underlying Dakota Formation in the permit and adjacent area are not appreciable. During drilling activities in the proposed Coal Hollow Mine permit and adjacent area, appreciable groundwater inflows were not encountered in the Tropic Shale. Other than a single seep (SP-37; Drawing 7-1) which discharges at a rate of less than 0.05 gpm from an apparent fracture system in a sandy horizon along the eastern margin of lower Sink Valley, no springs or seeps with measurable discharge have been identified in the Tropic Shale. The lack of appreciable groundwater discharge in the Tropic Shale is a result of the poor water transmitting properties of the marine shale unit. While sandstone units occur stratigraphically higher in the Tropic Shale in the surrounding area, in areas proposed for surface mining, the unit present consists of a fairly uniform sequence of soft shale, silty shale, and claystone with minor siltstone horizons. Competent sandstone strata in the Tropic Shale overlying proposed mining areas was not observed during drilling. The Tropic Shale acts as a barrier impeding downward migration of groundwater in the proposed Coal Hollow Mine permit and adjacent area where it is present. The unit also forms a basal confining layer for alluvial groundwater systems in the proposed permit area.

Groundwater discharge from the Dakota Sandstone in the permit and adjacent area is also meager. The Dakota Formation consists of shaley strata interbedded with lenticular, fine- to medium-grained sandstone and coal. Because of the pervasiveness of interbedded low-permeability horizons in the formation and the vertical and lateral discontinuity of sandstone horizons, the potential for vertical and horizontal movement of groundwater is limited. While no springs discharge from the Dakota Formation in the permit area, a spring with a discharge of about 1 gpm and displaying little seasonal variability in discharge (SP-4; Drawing 7-1) discharges from an apparent fault zone in the Dakota Formation approximately 1.1 miles south of the proposed Coal Hollow permit area. Additionally, two seeps with discharges of less than 0.05 gpm (SP-27 and SP-34; Drawing 7-1) seep from the Dakota Formation in lower Sink Valley more than ½ mile

south of the proposed Coal Hollow Mine permit area. The results of slug testing performed on wells screened in the Smirl coal seam indicate relatively low values of hydraulic conductivity for the coal seam (Table 7-8). In much of the proposed mining area, the coal seam is dry (UDOGM, 2007). Thus, appreciable migration of groundwater through the Smirl coal seam is not anticipated.

No water wells are known to exist in the Tropic Shale or Dakota Formation in the proposed Coal Hollow Mine permit and adjacent area, demonstrating the inability of these formations to transmit useful quantities of water to wells. Groundwaters from the Tropic Shale and Dakota Formation do not contribute measurable baseflow to streams in the proposed permit and adjacent area (at least at the surface in stream channels).

Natural groundwater discharge in the permit and adjacent area occurs primarily from alluvial sediments. Alluvial discharge occurs both as discrete springs and seeps (Drawing 7-1) and also locally as diffuse seepage to the surface. Groundwater discharge areas in the proposed Coal Hollow Mine permit and adjacent area are shown on Drawing 7-4 (see also photograph section). The area of most appreciable alluvial groundwater discharge occurs in central Sink Valley in the northwest quarter of Section 29, T39S, R5W (see Drawing 7-4; groundwater discharge area A). The alluvial groundwater system in this area exists under artesian conditions, resulting from the presence of a considerable thickness of sloping, low permeability clayey sediments overlying coarser, water-bearing alluvial sediments at depth (See cross-section Y – Y' in Drawing 6-9). The artesian alluvial groundwater system in Sink Valley is likely recharged via mountain-front-recharge along the flanks of the Paunsaugunt Plateau to the east and north of the proposed Coal Hollow Mine permit area. This artesian alluvial groundwater system that exists along the eastern margins of Sink Valley is likely continuous from near mountain-front recharge areas southward along the eastern margins of Sink Valley to the lower portion of Sink Valley. Discharge from the alluvial groundwater systems in and adjacent to the proposed Coal Hollow Mine permit area occurs primarily in two areas (Drawing 7-4). In the northwest quarter of Section 29, T39S, R5W, considerable natural discharge from the alluvial groundwater system occurs through springs and seeps (Drawing 7-4; groundwater discharge area A). Minor discharge from several flowing artesian wells also occurs in this area. The artesian alluvial groundwater system in eastern Sink Valley also likely provides recharge to the clayey alluvial sediments in the southwestern portion of the valley in the proposed Coal Hollow Mine permit area. Discharge from the alluvial groundwater system in groundwater discharge area A area results in decreases to the amount of water in storage in the alluvial groundwater system and also decreases in artesian hydraulic pressure in the aquifer.

Appreciable discharge from the alluvial groundwater system also occurs in lower Sink Valley in the northwest quarter of Section 32, T39S, R5W (see Drawing 7-4; groundwater discharge area B). Sink Valley constricts markedly in this area, which forces shallow alluvial groundwaters flowing down the valley to discharge at the land surface as springs, seeps, and diffuse discharge to the surface (i.e., there is a significant decrease in the cross-sectional area of the alluvial sediments). Groundwater discharge in

this area occurs from diffuse seepage to the surface and also as discharges to two springs and several small seeps (Drawing 7-1).

Much of the alluvial groundwater in Sink Valley likely ultimately leaves the valley via evapotranspiration. This conclusion is based on the observation that there is very rarely any discharge of surface water (at least at the surface in the channel) in Sink Valley Wash below Sink Valley (See site SW-9; Drawing 7-2; UDOGM, 2007). The clayey, low-permeability sediments present at the surface over most of Sink Valley also impede appreciable infiltration of precipitation and snowmelt waters into the deeper subsurface. Hence, groundwater recharge to the lower half of the Sink Valley sediments (including the proposed Coal Hollow Mine permit area) likely occurs primarily via horizontal migration of alluvial groundwaters from up-gradient areas.

Flowing artesian groundwater conditions are also observed in monitoring wells screened near the base of the alluvial sediments in the northwest corner of Section 32 T39S, R5W. It is probable that the artesian alluvial groundwater system in Section 29, T39S, R5W is continuous with that in the northwest corner of Section 32. It should be noted that within the proposed Coal Hollow permit area, artesian conditions were not observed in monitoring wells. While the thickness of the alluvial sediments in the artesian groundwater system east of the proposed Coal Hollow permit area range up to 150 feet thick, the thickness of alluvium overlying areas with mineable coal in the proposed Coal Hollow permit area generally does not exceed about 50 feet and in many locations it is considerably thinner.

Natural discharge of alluvial groundwater in the Robinson Creek drainage area is meager. This condition is largely due to the presence of the elevated ridge of impermeable Tropic Shale bedrock associated with the Sink Valley Fault that dissects and effectively isolates the alluvium east of the fault from that west of the fault (See Drawing 6-1). Because of the low permeability of the Tropic Shale, this condition apparently forces alluvial groundwater east of the Tropic Shale ridge to flow to the south toward Sink Valley that would otherwise report to the Robinson Creek drainage. During high flow conditions in the alluvial groundwater system east of the Tropic Shale ridge, minor amounts of groundwater "overtop" the bedrock ridge and drain via surface flow over the Tropic Shale bedrock, where it either recharges shallow alluvial sediments to the west of the fault or is lost to evapotranspiration. The influence of the Tropic Shale ridge is readily evident in field observations, with marked differences in vegetation and soil moisture being apparent on opposite sides of the ridge. During low-flow conditions, discharge from the overtopping of the bedrock ridge has generally not been observed. Isolated areas of soil wetness and shallow perched alluvial groundwater systems that exist west of the bedrock ridge in the northeast corner of Section 30 and the southeast corner of Section 19, T39S, R5W are likely sourced via this mechanism.

Seepage of alluvial groundwater into the deeply incised lower Robinson Creek stream channel occurs near the contact with the underlying Dakota Formation in the southeast quarter of Section 19, T39S, R5W. This water is likely related to saturated alluvial deposits underlying the Robinson Creek stream channel. The alluvial groundwater

emerges near where the stream channel intersects the alluvial groundwater system. It is noteworthy that the location of the emergence of alluvial water in the channel has varied somewhat over time. The bank seepage water is likely alluvial groundwater that seeps to the surface where the incised stream channel intersects the potentiometric surface of the alluvial groundwater system. Typically, this is near the contact with the underlying Dakota Formation bedrock in the bottom of the stream channel. Because of the seasonal changes in the elevation of the potentiometric head in the alluvial groundwater system, the location of the bank seepage is variable over time (i.e. the variability in the bank seepage locations are likely controlled primarily by temporal variability in potentiometric levels in the alluvial groundwater system rather than by fixed, permeability-controlled groundwater preferential pathways in the aquifer skeleton). Consequently, the bank seepage locations are not well-defined point sources, but rather dynamic seepage fronts along this general reach of the stream.

The Robinson Creek stream channel above this location is almost always dry (except for in direct response to torrential precipitation events or during the springtime runoff season during wet years. This seepage of alluvial water in the Lower Robinson Creek channel is typically about 5 to 10 gpm or less and is routinely monitored at monitoring station SW-5 (Drawing 7-2).

Information on water quality for groundwaters and surface-waters has been uploaded into the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007) and is summarized and described in Appendix 7-1.

Appreciable spatial variability exists in water quality in groundwaters and surface waters in the proposed Coal Hollow permit and adjacent area. Stiff diagrams depicting solute compositions and overall water quality for groundwaters and surface waters in the proposed Coal Hollow Mine permit and adjacent area are shown in Appendix 7-1. Important water quality characteristics for groundwaters are summarized below.

Groundwater Source	Chemical type	TDS (mg/L)
Alluvial groundwaters, coarse-grained system east of proposed permit area	Calcium-magnesium-bicarbonate	380 mg/L to 500 mg/L typically, Little seasonal variability
Alluvial groundwaters in south sink valley	Variable, magnesium-bicarbonate sulfate, calcium-magnesium-bicarbonate	450 mg/L to 3,600 typically, Highly variable based on season and climate for shallow systems, less variability in deeper system
Dakota Formation, fault groundwater system south of proposed permit area	Sodium-bicarbonate	500 mg/L to 600 mg/L typically, Little seasonal variability

It is apparent that the overall water quality of alluvial groundwater degrades from the mountain-front recharge water to the artesian groundwater system east of the proposed Coal Hollow permit area to the non-artesian shallow alluvial groundwater systems located in the more distal portions of Sink Valley. These changes are due to groundwater interaction with soluble minerals in the primarily Tropic Shale-derived sediments that make up the shallow alluvial materials in the proposed permit area.

This down-gradient degradation in water quality is shown graphically on Drawing 7-5. In Drawing 7-5, the average specific conductance values in µS/cm for representative springs and seeps in the Sink Valley drainage are plotted on the map as circles with the circle areas being proportional to the specific conductance average for the spring or seep. The specific conductance information used in generating Drawing 7-5 has been submitted electronically to the Division's hydrology database (UDOGM, 2007). It is readily apparent from Drawing 7-5 that the specific conductance (which is a reflection of the dissolved solids concentration) is degraded from the mountain-front recharge water (represented by stream SW-8) to the artesian alluvial groundwater system in the northwest quarter of Section 29, T5W, R39S, to the alluvial groundwaters in the southern portion of Sink Valley below the Coal Hollow Mine permit area.

Specific conductance values were used for plotting in Drawing 7-5 because specific conductance values are available for all springs and seeps, while laboratory chemical analyses are available for only some of the springs and seeps. Stiff (1951) diagrams for selected springs along this geochemical evolutionary pathway are shown on Figure 14 of Appendix 7-1. It is apparent from the Stiff diagrams and from geochemical information submitted to the Division (UDOGM, 2007) that the mountain-front recharge water (represented by monitoring site SW-8 in upper Swapp Hollow) is of the calcium-magnesium-bicarbonate chemical type with an average TDS concentration of 333 mg/L. Groundwater downgradient of the mountain-front recharge areas in the artesian alluvial groundwater system in Section 29, T5W, R39S, is also of the calcium-magnesium-bicarbonate chemical type, with an average TDS concentration at artesian well Y-61 of 400 mg/L. Further downgradient in the artesian alluvial groundwater system in Section 29, the geochemical composition at SP-8 is of the calcium-magnesium-bicarbonate chemical type with a somewhat increased TDS concentration of 425 mg/L. In the lower portions of Sink Valley in Section 32, T5W, R39S, the chemical quality of the alluvial groundwater is appreciably degraded relative to that in the upper portions of the groundwater system. At spring SP-6, the composition of the alluvial groundwater is seasonally variable and is of the magnesium-bicarbonate-sulfate, or calcium-magnesium-bicarbonate-sulfate chemical type. The TDS concentrations at SP-6 average 970 mg/L. The chemical composition of alluvial groundwater at SP-33 is of a geochemical type similar to that at SP-6, although TDS concentrations are somewhat lower, averaging 795 mg/L. The spatial variability apparent in the TDS concentrations in the alluvial groundwater in Section 32 is likely related to flushing effects resulting from higher groundwater fluxes through zones of increased permeability in the alluvium. It is noteworthy that groundwater in the gravelly zones in the deeper alluvial east of the

permit area in Section 32 monitored at the 85-foot deep well LS-85 is considerably lower in TDS concentration with an average of 457 mg/L. The lower TDS concentrations of artesian alluvial groundwater in the deeper, coarser-grained portions of the alluvium are likely attributable to the isolation of these groundwaters from the shallow, clayey, Tropic Shale derived alluvial sediment in the near-surface alluvial groundwaters.

The appreciable temporal variability in the solute geochemical compositions of the shallow alluvial groundwaters in Section 32 is likely attributable to seasonal and climatic variability in the groundwater flux rate through these systems and corresponding variability in rock/water ratios and residence time in the evaporate mineral rich Tropic Shale derived shallow alluvial sediments present in this portion of Sink Valley. Alluvial groundwaters in the deeper portions of Sink Valley to the east in Section 32 are part of a larger, more continuous groundwater system that is hydraulically isolated from overlying shallow recharge sources, and consequently have not exhibited similar temporal variability in solute geochemical composition.

Surface Water Resources

Surface water resources in the proposed Coal Hollow Mine permit and adjacent area are described in Appendix 7-1 and are summarized below.

Surface waters in the proposed Coal Hollow Mine permit and adjacent area are tributary to Kanab Creek. Surface waters in the northern portion of the proposed permit and adjacent area drain into the Robinson Creek and upper Kanab Creek drainages. Surface waters in the southern portion of the proposed permit and adjacent area drain into the Sink Valley Wash drainage which is tributary to Kanab Creek about 6 miles below the proposed Coal Hollow Mine permit area. Surface water drainages in the permit and surrounding areas are shown in Appendix 7-1. Surface water baseline monitoring stations are shown on Drawing 7-2. Locations of surface-water water rights in and adjacent to the proposed Coal Hollow Mine permit and adjacent area are shown on Drawing 7-3. Water rights data from the proposed Coal Hollow Mine permit and adjacent area are detailed in Appendix 7-3.

Information on water quality for groundwaters and surface-waters has been uploaded into the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007) and is summarized and described in Appendix 7-1.

Surface waters in Kanab Creek are used for stock watering and crop irrigation in the irrigable lands adjacent to Kanab Creek west of the proposed Coal Hollow Mine permit area. Discharge in Kanab Creek measured near the town of Alton (SW-1) is seasonally dependent and largely influenced by upstream water use. Discharge in Kanab Creek monitored at SW-1 typically ranges from 10 cfs or less during the springtime runoff period to 1 cfs or less during the summertime.

Discharge in Lower Robinson Creek drainage is meager. Other than during the springtime runoff event in wet years or during torrential precipitation events, flow has not been observed at monitoring stations SW-4 and SW-101 (Drawing 7-2). Discharge at the lower monitoring site on Lower Robinson Creek (SW-5; Drawing 7-2) is meager. The small discharge occasionally present at SW-5 is derived from the seepage of alluvial groundwater into the Lower Robinson Creek stream channel between monitoring sites SW-101 and SW-5

Tributaries to the Sink Valley Wash drainage in the proposed Coal Hollow Mine permit and adjacent areas include (from north to south) Water Canyon, an unnamed drainage south of Water Canyon in Section 21 T39S, R5W, and Swapp Hollow. Discharge rates in these drainages are highly seasonally dependent (UDOGM, 2007; Appendix 7-1). Discharges in the Water Canyon and Swapp Hollow drainages are intermittent or perennial in nature with discharge peaks occurring during the springtime runoff season and much lower flows occurring during the late summer and fall months. Discharge in the unnamed drainage in Section 21 T39S, R5W is ephemeral.

The water quality and discharge characteristics of surface waters in the proposed Coal Hollow Mine permit and adjacent area are presented in UDOGM (2007) and described in Appendix 7-1. Solute compositions of stream waters are also depicted graphically as Stiff diagrams in Appendix 7-1. The solute compositions of surface waters in the proposed Coal Hollow Mine permit and adjacent area are summarized below.

Source	Chemical type	TDS (mg/L)
Robinson Creek/Dry Fork	Calcium-magnesium-bicarbonate	300 mg/L typical
Lower Robinson Creek	Variable, magnesium-sulfate-bicarbonate	300 – 3,000 mg/L typical, dependent on discharge
Swapp Hollow	Calcium-magnesium-bicarbonate	250-350 mg/L typical
Kanab Creek	Magnesium-calcium-bicarbonate-sulfate during high flow, variable during low-flow, variability likely due largely to interaction with Tropic Shale soils and irrigation return flows	500-1,300 mg/L typical, Variable dependent on season and irrigation use
Sink Valley Wash	Magnesium-calcium-bicarbonate	600 -1,500 mg/L typical, variable dependent on discharge

Considerable seasonal variability exists in the solute compositions of stream waters in Kanab Creek in the proposed Coal Hollow Mine permit and adjacent area (UDOGM, 2007; Appendix 7-1). During low-flow conditions, interactions between stream waters and Tropic Shale or Tropic Shale-derived alluvial sediments likely result in increased TDS concentrations. Return flow from irrigated fields and interactions with soils rich in soluble minerals also likely contribute to increased TDS concentrations in the summertime. During the spring runoff season, high surface-water flows that originate from the adjacent upland areas dominate the flow in the channel. The TDS concentrations of Kanab Creek waters during high-flow conditions are thus lower than during the low-flow season. Much less seasonal variability in solute content in surface water flows from the mountain stream in Swapp Hollow (UDOGM, 2007; Appendix 7-1). This condition is likely attributable to the fact that the stream in Swapp Hollow, which originates on geologic formations overlying the Tropic Shale, has considerably less contact with the Tropic Shale than does Kanab Creek. Additionally, there are no known irrigation diversions or returns above the stream monitoring point (SW-8; Drawing 7-2) in Swapp Hollow.

722 CROSS SECTIONS AND MAPS

722.100 A map showing the locations of springs and seeps in the proposed Coal Hollow Mine permit and adjacent area is presented in Drawing 7-1. A map showing potentiometric levels in alluvial groundwater systems in the proposed Coal Hollow and adjacent areas is presented in Drawing 7-13. It is important to note that the alluvial groundwater potentiometric contours depicted in Drawing 7-2 are not representative of a laterally or vertically continuous groundwater system. Within the proposed Coal Hollow Mine permit and adjacent area, appreciable portions of the alluvial sediments are not saturated. Additionally, perched groundwater conditions are present in many locations in the alluvium in the area. In other words, the alluvial groundwater systems in the proposed Coal Hollow Mine permit and adjacent area are not a single, interconnected aquifer. Rather, there exist several areas of saturated alluvium, which may or may not be in good hydraulic communication with adjacent areas. Consequently, it is not possible or meaningful to construct a true potentiometric contour map in the strict sense. Consequently, it is not appropriate to evaluate regional potentiometric trends over large distances or to infer precise groundwater flow directions or hydraulic gradients in the alluvial groundwater system based on Drawing 7-2. The alluvial groundwater system potentiometric map presented in Drawing 7-2 is useful for evaluating approximate local potentiometric conditions general saturation trends.

722.200 Location of surface water bodies

Within the proposed Coal Hollow Mine permit and adjacent area, no significant natural ponds or lakes occur. The locations of springs and streams are shown in Drawing 7-1. Many small earthen impoundments and ponds have been created to store surface-water runoff and spring discharge water for stock watering and irrigation use. The locations of ponds and associated conveyance ditches are shown on Drawing 7-7.

722.300 Baseline monitoring stations

Baseline monitoring stations are shown on Drawing 7- 2. A map showing the locations of monitoring wells in the proposed Coal Hollow permit and adjacent area is presented in Drawing 7-12 and on Figure 12 of Appendix 7-1. Drawings 7-2 and 7-12 also show monitoring stations from which baseline hydrologic data were collected in previous studies. Monitoring station locations, elevations, and other details are presented in Table 7-1.

722.400 Location of water wells

Water well locations are shown in Drawing 7-2 and Drawing 7-12. Well construction details and locations are presented in Table 7-2.

722.500 Contour map(s) of disturbed area(s)

Surface contours representing the existing land surface configuration of the proposed permit area (including potentially disturbed areas) are shown on Drawing 5-1 and the post mining land configuration is shown on 5-35. Cross sections with both these landforms are shown on Drawing 5-36. The premining landform, with exception of the Facilities area and Lower Robinson Creek, are from an aerial flight that was limited to a five foot contour interval. Therefore, contours have been interpolated down to a 2 foot level using the available aerial flight information. This interpolation provides accuracy for the Division to make the necessary determinations. The Facilities area and portions of Lower Robinson Creek are actual survey data to the accuracy of 2-foot contours.

723 SAMPLING AND ANALYSIS

Water quality sampling and analyses have been and will be conducted according to the "Standard Methods for the Examination of Water and Wastewater" or EPA methods listed in 40 CFR Parts 136 and 434. Information regarding laboratory analytical methods utilized in performing water quality analyses at the analytical laboratories has been submitted to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007).

724 BASELINE INFORMATION

Baseline groundwater, surface-water, geologic, and climatologic data are described in Appendix 7-1 and summarized below.

724.100 Groundwater Information

The location of wells and springs in the proposed Coal Hollow Mine permit and adjacent area are shown on Drawings 7-1 (Spring and seep survey map), 7-2 (Baseline monitoring locations), and 7-12 (Monitoring well location map). Groundwater rights in and around the proposed Coal Hollow Mine permit area are shown on Drawing 7-3 and tabulated in Appendix 7-3.

Seasonal quality and quantity of groundwater and usage is presented in Appendix 7-1 and UDOGM (2007). Baseline discharge and water quality data have been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality (UDOGM, 2007).

Baseline monitoring of groundwater resources in and around the proposed Coal Hollow permit area have been carried out by several entities. Previous hydrologic studies of the region have been made in the Alton Coal Field area by Goode (1964, 1966), Sandberg (1979), Cordova (1981), and Plantz (1983). Selected hydrologic data collected in conjunction with these studies have been incorporated into the hydrologic analysis and baseline data included in this permit application.

During the 1980's, extensive monitoring of groundwater resources in the proposed permit and surrounding areas was performed by Utah International, Inc. Utah International Inc.'s groundwater monitoring activities included the construction of numerous groundwater monitoring wells, aquifer testing activities, and the performance of discharge, water level, and field and laboratory water quality monitoring of springs, seeps, and wells. These baseline monitoring activities were performed as part of a proposed coal mine permitting action in the Alton Coal Field. Ultimately, the proposed coal mining action did not proceed. Relevant monitoring information from the Utah International, Inc. baseline monitoring activities have been included as supplemental baseline data included in this permit application.

Commencing in the 2nd quarter of 2005, regular quarterly baseline monitoring of groundwater resources has been commissioned by Alton Coal Development, LLC. Baseline monitoring of springs, seeps, and groundwater wells in and around the proposed Coal Hollow Mine permit area have been routinely performed. Data collected in the baseline monitoring activities have been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007).

Baseline potentiometric information from wells has been input into the DOGM database. For non-flowing-artesian wells, this information has been input in a depth-to-water-relative-to-the-top-of-the-well-casing format using units of feet. For wells experiencing flowing artesian conditions, the potentiometric data are reported to the database in feet as a height-of-the-potentiometric-surface-above-the-top-of-the-well-casing format expressed as a negative number (which makes the flowing-artesian and non-flowing-artesian potentiometric measurements directly comparable). For both conditions, the reported measurements can be directly converted to an absolute water elevation by subtracting the reported value from the elevation of the top of the well casing.

The potentiometric head in monitoring wells experiencing flowing-artesian conditions is measured either 1) by temporarily extending the height of the well casing and allowing the water level to stabilize and the performing a height of the water column measurement (where the artesian pressure is small), or 2) by using a pressure gauge to measure the shut-in artesian pressure in the well and then converting that number to an equivalent height in feet.

During December 2006 and January 2007 an extensive drilling and monitoring well construction program was implemented. This hydrogeologic program included the installation of 30 groundwater monitoring wells in and adjacent to the proposed Coal Hollow Mine permit area. The focus of the drilling program was to characterize the stratigraphy and hydrogeologic properties of alluvial groundwater systems in and adjacent to proposed mining areas. Aquifer characterization of the alluvial groundwater system was also performed using pump testing and slug testing techniques. Investigative methods utilized and the results of the analysis of the data are described in Appendix 7-1.

724.200 Surface Water Information

The locations of streams, stock watering ponds, and conveyance ditches in the proposed Coal Hollow Mine permit and adjacent area are shown on Drawing 7-7. Surface-water rights in and adjacent to the proposed Coal Hollow Mine permit area are shown on Drawing 7-3 and tabulated in Appendix 7-3. Surface-water discharge rates and water quality data have been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007). Additional surface-water information is provided in Appendix 7-1.

It is not anticipated currently that discharge from the proposed Coal Hollow Mine will be necessary. Where necessary, alluvial groundwater that may be intercepted by mining will be placed in drains and diverted away from disturbed areas and discharged (i.e., as groundwater dewatering). However, a Utah UPDES discharge permit will be obtained so that if discharge of mine water becomes necessary, it can be discharged in accordance with the UPDES discharge permit. The exact locations of mine water discharge points will be established upon issuance of the UPDES discharge permit. Any mine discharge water will be placed in either the Lower Robinson Creek drainage or the Sink Valley Wash drainage. Both of these drainages are tributary to Kanab Creek.

As described in R645-301-728.320, acid drainage is not expected from the proposed mining operation. This is due to the pervasiveness of carbonate minerals in the mine environment that will neutralize any acid produced.

Seasonal quality and quantity of groundwater and usage is described herein and in Appendix 7-1. Baseline discharge and water quality data have been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality (UDOGM, 2007).

Baseline monitoring of surface-water resources in and around the proposed Coal Hollow permit area have been carried out by several entities. Previous hydrologic studies of the have been made in the Alton Coal Field area by Goode (1964, 1966), Sandberg (1979), Cordova (1981), and Plantz (1983). Selected hydrologic data collected in conjunction

with these studies have been incorporated into the baseline data as part of this permit application.

During the 1980's, extensive monitoring of surface water resources in the proposed permit and surrounding areas was performed by Utah International, Inc. Utah International Inc.'s groundwater monitoring activities included the operation of continuous recording stations on selected streams, and the performance of routine surface-water discharge measurements and field and laboratory water quality analyses. These baseline monitoring activities were performed as part of a proposed coal mine permitting action in the Alton Coal Field. Ultimately, the proposed coal mining action did not proceed. Relevant monitoring information from the Utah International, Inc. baseline monitoring activities have been included as supplemental baseline data as part of this permit application.

Commencing in the 2nd quarter of 2005, regular quarterly baseline monitoring of surface-water resources has been commissioned by Alton Coal Development, LLC. Baseline monitoring of surface-waters in and around the proposed Coal Hollow permit area, including surface-water discharge measurements and field and laboratory water quality analyses, have been routinely performed.

All surface waters in the proposed Coal Hollow Mine permit and adjacent area are tributary to the Kanab Creek drainage. Surface-water monitoring stations from which baseline data have been collected are shown on Drawing 7-2 and include the following:

Sink Valley Wash drainage

SW-8 (Swapp Hollow above proposed mining areas), SW-7 (unnamed drainage in Section 21, T39S, R5W), RID-1 (irrigation diversion of water from Water Canyon drainage above proposed mining areas), SW-6 (headwaters of unnamed tributary to lower Sink Valley Wash), and SW-9 (Sink Valley Wash below proposed mining areas).

Lower Robinson Creek drainage

SW-4 (Robinson Creek above proposed mining areas), SW-101 (Lower Robinson Creek near proposed mining areas), and SW-5 (Lower Robinson Creek below proposed mining areas).

Kanab Creek drainage

SW-1 (Kanab Creek near Alton, Utah; above proposed mining areas), SW-3 (Kanab Creek above proposed mining areas), and SW-2 (Kanab Creek below Lower Robinson Creek and below proposed mining areas)..

724.300 Geologic Information

Geologic information in sufficient detail to determine the probable hydrologic consequences of mining and determine whether reclamation as required by R645 can be accomplished is given in Chapter 6 of this permit application package and in Appendix 7-1.

724.400 Climatological Information

Climatological information, including temperature and precipitation data, have been routinely measured and recorded at the Alton, Utah weather station (420086) since 1928. The station is located in the town of Alton, approximately two miles north of the proposed Coal Hollow Mine permit area. Climatological data collected at the Alton station for the 77 year period from 1928 to 2005 are summarized in Table 7-3. Climatological data from the proposed Coal Hollow Mine permit and adjacent area are plotted in Drawing 7-8.

An automated weather station was installed in the proposed Coal Hollow Mine permit area in December 2005. The station is configured to continuously monitor and record temperature, wind velocity, and wind direction data. The station is also configured to continuously measure and record precipitation, although the tipping rain-gauge is not operative during winter months. Climate data from the proposed Coal Hollow Mine and adjacent area are also presented in Appendix 7-6.

724.411 Seasonal precipitation

Precipitation data from the Alton, Utah weather station indicates average annual precipitation of 16.38 inches per year. Doelling (1972) reports average annual precipitation in the Alton Coal Field area ranging from 9 to 20 inches annually with slightly higher increments likely in the higher parts of the plateau (Doelling, 1972). There are generally two annual wet periods in the region. During the wintertime, cyclonic storms bring precipitation (mainly snowfall) to the region. During the summertime, storms originating from convection of air from the Gulf of Mexico or the Pacific Ocean bring rains to the region. Of the two annual wet cycles, the summer rainfall is most reliable. Average monthly precipitation at the Alton station ranges from a low of 0.57 inches in June to a maximum of 1.80 inches in February. Daily temperature and precipitation data recorded at the Coal Hollow Project weather station during 2006 and early 2007 are presented in Appendix 7-6.

The Palmer Hydrologic Drought Index (PHDI; NCDC, 1997) indicates long-term climatic trends for the region. The PHDI is a monthly value generated by the National Climatic Data Center (NCDC) that indicates the severity of a wet or dry spell. The PHDI is computed from climatic and hydrologic parameters such as temperature, precipitation, evapotranspiration, soil water recharge, soil water loss, and runoff. Because the PHDI takes into account parameters that affect the balance between moisture supply and moisture demand, the index is a useful for evaluating the long-term relationship between climate and groundwater recharge and discharge. A plot of the PHDI for Utah Region 4 (which includes the proposed Coal Hollow Mine permit and surrounding area) is shown in Drawing 7-9. It is apparent in Drawing 7-9 that the region has experienced cyclical periods of drought and wetness since 1980. Baseline hydrologic monitoring performed by Utah International, Inc in 1987 and 1988 occurred during a period of near normal wetness. Recent baseline hydrologic monitoring conducted in 2005 and 2006 occurred during a period of moderate to severe wetness, with 2005 being wetter than 2006.

724.412 Wind direction and velocity

Wind data have been collected at the Coal Hollow Project weather station since December 2005. Monthly wind data from the Coal Hollow Project weather station are available from January 2006 through March 2006, and from November 2006 through May 2007. Monthly wind data are plotted as wind rose diagrams, which depict the average direction and velocity of prevailing winds, in Appendix 7-1. Based on recent data from the Coal Hollow Project weather station, it is apparent that the predominant wind direction in the proposed Coal Hollow Mine permit area (during the months for which data are available) are from the northeast, with secondary peaks from the north and south-southwest (Appendix 7-1). Surface winds recorded at the Coal Hollow Project weather station averaged about 6.4 miles per hour. Tabulated hourly wind data from the

Coal Hollow Project weather station are maintained on file at Alton Coal Development, LLC.

Wind data have also been collected historically at nearby locations by governmental and other entities. The regionally predominant direction of winds in the region is southwest through west. Secondary peaks are from southeast and northwest. Surface winds in the area average approximately 8 miles per hour. Higher wind speeds are associated with fronts and storms and generally occur during the springtime.

724.413 Seasonal temperature ranges

Temperature data from the region are summarized in Table 7-3. Temperatures in the permit area vary greatly. Temperature data from the Alton station (1928-2005) indicate that monthly average low temperatures are below freezing for the 6-month period from November to April. Monthly average minimum temperatures range from a low of 15.1 °F during January to a high of 49.8 °F in July. Monthly average maximum temperatures range from a low of 39.5 °F in January to a high of 82.6 °F in July. Daily maximum and minimum temperature data collected at the Coal Hollow Project weather station during 2006 and the first quarter of 2007 are presented in Appendix 7-6 and plotted in Drawing 7-8. The maximum temperature recorded during this period was 93.3 °F in July 2006. The minimum temperature recorded during this period was -7.3 °F in January 2007.

724.500 Supplemental Information

Other than the possible short-term diminution in discharge rates from alluvial groundwater systems, including the potential short-term diminution of discharge rates from some springs and seeps in Sink Valley, adverse impacts to the hydrologic balance, either on or off the permit area are not expected to occur. It is not anticipated that acid- and toxic-forming materials will cause significant contamination of groundwater or surface-water supplies. Any discharges of mine waters to surface-water systems will be regulated under and meet the criteria of a UPDES discharge permit. The mining and reclamation plan has been designed to minimize the potential for disturbance or disruption of the hydrologic balance and to protect groundwater and surface-water resources in the area.

If substantial alluvial groundwater inflows into mining areas occur as mining progresses in close proximity to alluvial springs and seeps in the eastern ¼ of Section 30, T39S, R5W and the northwest ¼ of Section 29, T39S, R5W or in close proximity to coarse-grained alluvial sediments in the artesian groundwater system along the eastern side of Sink Valley, Alton Coal Development, LLC will evaluate hydrogeologic conditions at the time such may occur. It should be noted that very large discharges into mine workings are not anticipated based on the results of recent drilling and aquifer testing performed in these areas (see Appendix 7-1). Based on the hydrogeologic conditions encountered, where necessary Alton Coal Development, LLC will use a suitable technique to minimize

groundwater inflow rates into the mine, which may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to protect groundwater resources up-gradient of mining activities. The potential for success of such protective measures in minimizing drainage of alluvial deposits up-gradient of proposed mining areas is believed to be good, given that the thickness of the alluvium in these areas is generally on the order of about 20 to 50 feet and these sediments are directly underlain by essentially impermeable Tropic Shale in proposed mining areas. It is important to note that while temporary impacts to groundwater discharge rates from alluvial springs and seeps could possibly occur, these impacts will likely be short-lived. This conclusion is based on the fact that individual mine pits in most instances will remain open for no more than about 60 to 120 days. After mine pits are backfilled and reclaimed, the potential for appreciable continued drainage of up-gradient alluvial groundwater through the backfilled pits in that area is low. When mining is complete in an area, seasonal recharge to alluvial groundwater systems will gradually replenish groundwater to the alluvial groundwater system. Large-scale dewatering of the alluvial groundwater system, such that appreciable compaction of the aquifer skeleton could occur, is not anticipated (see Appendix 7-1).

If diminution of discharge rates from seeps and springs does occur as a consequence of mining and reclamation activities, any lost water will be replaced according to all applicable Utah State laws and regulations using the water replacement source specified in R645-301-727. The quantity and quality of replacement water detailed in R645-301-727 will be suitable for the existing premining uses and approved postmining land uses.

It should be noted that the proposed Coal Hollow Mine plan calls for the permanent diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the proposed diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of groundwater or surface-water resources, where required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

If excess groundwater were to be encountered during mining operations such that it could not be adequately managed or discharged in compliance with the Utah UPDES discharge permit (which is considered unlikely), Alton Coal Development, LLC may when necessary and with the approval of the Utah Division of Oil, Gas and Mining construct supplemental containment and settlement ponds in which mine discharge waters may be held for treatment (where necessary) and subsequent discharge through UPDES discharge points in compliance with the UPDES discharge permit.

724.700 Alluvial Valley Floor Determination

A field investigation has been performed in the proposed Coal Hollow Mine permit and adjacent area to provide to the Division the information required to make an evaluation

regarding the existence of a probable alluvial valley floor in the proposed Coal Hollow Mine permit and adjacent area. The results of this field investigation and related information is provided in Appendix 7-1. Additional information regarding potential alluvial valley floors in the area is provided in Appendix 7-7.

A report detailing the findings of a previous field investigation performed by Water Engineering & Technology, Inc., entitled "Geomorphological and sedimentological characteristics of Sink Valley, Kane County, Utah" is included as Appendix 7-4.

725 BASELINE CUMULATIVE IMPACT AREA INFORMATION

Appendix 7-1 contains the results of a comprehensive investigation of groundwater and surface-water systems in the proposed Coal Hollow Mine permit and adjacent area. Appendix 7-1 also includes information regarding the probable hydrologic consequences of coal mining in the proposed Coal Hollow Mine permit area and recommendations for hydrologic monitoring. Appendix 7-1 also includes the results of a field investigation performed in the proposed Coal Hollow Mine permit and adjacent area to provide to the Division of Oil, Gas and Mining the information required to make an evaluation regarding the existence of a probable alluvial valley floor in the proposed Coal Hollow Mine permit and adjacent area. This Information together with the information submitted herein can be used to assess the probable cumulative hydrologic impacts of coal mining and reclamation operations in the proposed Coal Hollow Mine permit and adjacent area as required by R645-301-729.

R645-301-726 Modeling

No numerical models have been created for the permit area nor are any planned.

727 ALTERNATIVE WATER SOURCE INFORMATION

This section provides information on the alternative water source that will be used to replace water from groundwaters or surface waters should they be impacted by mining and reclamation activities in the proposed Coal Hollow Mine permit and adjacent area. The alternative water source is a water production well planned for construction on private land leased by Alton Coal Development, LLC in the northwest quarter of Section 29, Township 39 South, Range 5 West. The planned location for the well, which is situated within the proposed Coal Hollow Mine permit area, is shown on Drawing 5-8C. The well will produce water from the alluvial groundwater system in Sink Valley in locations up-gradient of proposed mining operations. Based on aquifer testing performed in the alluvial groundwater system near the proposed water well (using the existing well Y-61 as a pump testing well), it is believed that adequate water can be produced from the new well to satisfy the potential water replacement needs of the mine. Details of the

aquifer testing and information on the hydrogeologic characteristics of the Sink Valley alluvial groundwater system are presented in Appendix 7-1.

Water quality data from the Sink Valley alluvial groundwater system near the location of the proposed new water well have been collected from well Y-102 and have been submitted electronically to the Utah Division of Oil, Gas and Mining Utah Coal Mining Water Quality Database (UDOGM, 2007). It is anticipated that the quantity and quality of water produced from the new water production well will be suitable for the existing premining uses and approved postmining land uses.

It should be noted that the proposed water replacement well source will produce water from the coarse-grained alluvial groundwater system in Sink Valley. Nearby springs that could potentially be impacted by mining and reclamation activities are supported by the same alluvial groundwater system. However, while modest decreases in the artesian hydraulic pressures in the alluvial groundwater system could potentially result in diminution of spring flows, the planned new water well will likely be approximately 100 feet deep and will be equipped with an electric well pump giving it the capacity to produce groundwater from the alluvial system even if the hydraulic head in the area were to be diminished such that artesian flow conditions temporarily ceased to exist.

An analysis of the total average discharge of state appropriated groundwaters from the permit and adjacent area has been performed to determine whether the quantity of water that could likely be produced from the new water replacement well will be adequate for potential replacement needs. Based on baseline spring discharge data submitted to the Division (UDOGM, 2007), it is determined that the average discharge of all state appropriated groundwater from groundwater discharge area A (Drawing 7-3, Drawing 7-4) is approximately 35 gpm. The state appropriated waters in groundwater discharge Area A include most of the significant springs in the area and essentially all of the largest springs in the area (Drawing 7-3; Appendix 7-3). The average discharge of all state appropriated groundwater from groundwater discharge area B (Drawing 7-4) is approximately 17 gpm. Using an unlikely worst-case scenario and assuming that all springs with state appropriated waters in both Areas A and B were to cease flowing, a total replacement of approximately 52 gpm would be required. The proposed new water well located in Section 29, Township 39 South, Range 5 West will be designed to produce water at that quantity and, therefore, should be able to provide adequate replacement water in even this worst-case scenario (which is not considered likely). Aquifer analysis described in Appendix 7-1 suggests that the yield of the alluvial groundwater system in which the new water well will be constructed should be capable of sustaining discharges of the required magnitude and for the lengths of time that the need for replacement water would be likely. It should be noted that if the need arises to provide replacement water for impacted state appropriated waters, the duration of the need will likely be of a relatively short duration (see Section 728 below).

Alton Coal Development, LLC has entered into a written agreement with the town of Alton, Utah to transfer the point of diversion for 50 acre-feet of water for use at the Coal Hollow Mine. A copy of this agreement is included in Appendix 7-8 (in confidential

binder). This water will be available for all uses at the mine including potential use for water replacement. The planned new water well will be constructed on lands currently leased by Alton Coal Development, LLC. Consequently, no new landowner access agreement will be required for the drilling of the well.

728 PROBABLE HYDROLOGIC CONSEQUENCES (PHC) DETERMINATION

This section describes the probable hydrologic consequences of surface coal mining in the proposed Coal Hollow Mine permit area. This determination is based on data presented herein and on information provided in Appendix 7-1. This mining and reclamation plan has been designed to minimize potential adverse impacts to the hydrologic balance. It should be noted that this PHC and also Appendix 7-1 may be updated periodically as required as additional hydrogeologic information and mining data become available in the future.

728.310 Potential adverse impacts to the hydrologic balance

Other than the possible short-term diminution in discharge rates from alluvial groundwater systems, including the potential short-term diminution of discharge rates from some springs and seeps in Sink Valley, appreciable adverse impacts to the hydrologic balance, either on or off the permit area are not expected to occur. The basis for this determination is discussed below.

As discussed in Section 721 above, minimal groundwater resources exist in the Tropic Shale, which directly overlies the coal reserves in proposed mining areas. Groundwater in the Tropic Shale does not provide measurable baseflow discharge to streams in the area. The lack of appreciable groundwater flow in the Tropic Shale is a result of the poor water transmitting properties of the marine shale unit. Consequently, it is anticipated that little groundwater will be encountered in the Tropic Shale in mining areas. Thus, the potential for adverse impacts to the hydrologic balance resulting from mining through the Tropic Shale in the proposed Coal Hollow Mine permit area is minimal.

Similarly, as described in Section 722 above, groundwater resources in the Dakota Formation underlying the coal seam to be mined are not appreciable. This condition is fundamentally a result of the heterogeneity of the rock strata in the Dakota Formation which impedes the ability of the formation to transmit groundwaters significant distances vertically or horizontally. The presence of the essentially impermeable Tropic Shale on top of the Dakota Formation also minimizes the potential for vertical recharge to the Dakota Formation. Mining operations will remove the overlying Tropic Shale rock strata from the Dakota Formation in addition to the Smirl coal seam deposit at the top of the Dakota Formation in mined areas. However, because the pre-mining hydraulic communication between the Tropic Shale and the underlying Dakota Formation in planned mining areas is believed to be minimal, the removal of the Tropic Shale overburden and Smirl coal seam from the Dakota Formation, followed by the rapid backfilling of pit areas with low-permeability fill materials should not result in adverse impacts to the hydrologic balance in the Dakota Formation (i.e., the post-mining degree

of hydraulic communication between the Dakota Formation and the overlying low-permeability backfill material will be similar to that of the pre-mined condition).

It should be noted that the first water-bearing strata underlying the coal seam to be mined in the proposed Coal Hollow Mine permit area from which appreciable quantities of groundwater can be produced is the Navajo Sandstone. The Navajo Sandstone aquifer is of regional significance in that it provides groundwater of good quality to domestic, agricultural, and municipal wells regionally and provides baseflow to springs and streams. The Navajo Sandstone does not crop out in the proposed Coal Hollow Mine permit and adjacent area. The formation is effectively isolated from proposed mining areas by more than 1,000 feet of rock strata of the Dakota and Carmel Formations (which includes large thicknesses of low-permeability shales and siltstones). The Navajo Sandstone aquifer will not be impacted by proposed mining operations. It should be noted that some previously proposed mining operations in the Alton Coal Field have proposed drilling and pumping of large amounts of groundwater from high-capacity production wells in the Navajo Sandstone aquifer for operational use. No such wells are planned in the proposed Coal Hollow Mine permit and adjacent area.

Of primary importance to the hydrologic balance in the proposed Coal Hollow Mine permit and adjacent area are alluvial groundwater systems. As discussed in Section 722 and in Appendix 7-1, alluvial groundwater systems in the area support springs, seeps, diffuse groundwater discharge, and a limited number of wells. The bulk of the alluvial groundwater flux through the area occurs in alluvial sediments that include coarse-grained and finer-grained sediments near the eastern margins of Sink Valley, east of the proposed Coal Hollow Mine permit area. Lesser quantities of alluvial groundwater migrate through finer-grained alluvial sediments (predominantly clays, silts, and sands) in the western portions of Sink Valley and in the Lower Robinson Creek drainage within the proposed Coal Hollow Mine permit area. Discharges from alluvial groundwater systems in Sink Valley do not contribute measurable quantities of baseflow to streams (at least at the surface in the stream channel). Alluvial groundwater systems in the Lower Robinson Creek area are much less extensive than the alluvial groundwater systems in Sink Valley. Other than the emergence of small quantities of alluvial groundwater from the stream banks where the stream channel intersects the alluvial groundwater system, discharge from the alluvial groundwater system as springs or seeps in Lower Robinson Creek is generally not observed. Perched groundwater conditions exist locally in the alluvial groundwater system in the Lower Robinson Creek drainage.

In the general sense, surface coal mining activities in the proposed Coal Hollow Mine permit area have the potential to impact groundwater systems primarily through three mechanisms:

1) Where water-bearing strata in proposed mining areas are mined through, groundwater systems within these strata will obviously be directly intercepted,
2) Where groundwater flow paths through mine openings are interrupted, groundwater flow in down-gradient areas could be diminished, and

3) Where mine openings intercept permeable strata, groundwater resources in up-gradient areas could potentially be diminished if appreciable quantities of groundwater were to be drained from up-gradient areas.

The potential for the occurrence of each of these potential impacts are described in the following.

Direct Interception of Groundwater Resources

As discussed above, groundwater resources in the relatively impermeable Tropic Shale in the proposed permit area are meager. Consequently, it is improbable that direct interception of appreciable groundwater in the Tropic Shale will occur. Additionally, because Tropic Shale groundwater systems generally do not support discharges to springs or provide baseflow to streams, the potential interception of limited quantities of groundwater in the Tropic Shale will not adversely impact the hydrologic balance. Similarly, groundwater resources in the Dakota Formation (including within the Smirl coal seam) are meager. While the Smirl coal seam will be extracted through mining operations, the underlying strata of the Dakota Formation will not be disturbed. Consequently, adverse impacts to groundwater systems in the Dakota Formation through direct interception of groundwater resources are not anticipated.

Alluvial groundwater systems in planned mining areas in the proposed Coal Hollow Mine permit area will be directly intercepted by the mine openings. It is not anticipated that the direct interception of shallow alluvial groundwater will adversely impact the overall hydrologic balance in the region. This is because no springs, seeps or other important groundwater resources have been identified in proposed mine pit areas (Drawing 7-1). In the pre-mining condition, any diffuse groundwater discharge to the ground surface that occurs is primarily lost to evapotranspiration and does not contribute appreciably to the overall hydrologic balance in the area.

Diminution of down-gradient groundwater resources

Where groundwater flow paths that convey groundwater to down-gradient areas exist in areas that will be mined, there is the potential that diminution of down-gradient groundwater resources could occur. In the proposed Coal Hollow Mine permit area, it is considered unlikely that appreciable diminution of down-gradient resources will occur as a result of mining and reclamation activities. The basis of this conclusion is presented below.

Groundwater resources in the Tropic Shale are meager and groundwater flow rates are very slow through the marine shale unit. Groundwater systems in the Tropic Shale do not support appreciable spring or seep discharge nor do they provide measurable baseflow to streams down-gradient of mining areas. Consequently, the potential for adverse impacts

to the hydrologic balance as a result of mining through Tropic Shale is considered minimal.

Similarly, groundwater resources in the Dakota Formation are meager. The potential for lateral and vertical migration of groundwater through the formation is limited by the pervasiveness of low-permeability shaley strata in the formation and the lateral discontinuity of permeable strata. Groundwater systems in the Dakota Formation do not support appreciable spring or seep discharge nor do they provide measurable baseflow to streams down gradient of mining areas. Additionally, with the exception of the relatively low-permeability Smirl coal seam located at the top of the formation, groundwater systems in Dakota Formation rock strata below the coal seam will not be disturbed by mining and reclamation activities. Consequently, the potential for adverse impacts to the hydrologic balance as a result of mining through Dakota Formation strata is considered minimal. It should be noted that spring SP-4 discharges at about 1 gpm approximately 1.1 miles south of the proposed Coal Hollow Mine permit area from an apparent fault/fracture system in the Dakota Formation that may be related to the Sink Valley Fault. It is unlikely that appreciable migration of groundwater through the Sink Valley Fault system in the relatively impermeable Tropic Shale or shallow alluvium in the proposed Coal Hollow Mine permit area occurs. Consequently, it is considered unlikely that mining and reclamation activities in the proposed Coal Hollow Mine permit area will cause a diminution of discharge from spring SP-4.

Alluvial groundwater systems in proposed mining areas area supported primarily by clays, silts, and fine-grained sands. In proposed mining areas in Sink Valley, appreciable coarse-grained alluvial sediments were not encountered in drill holes or back-hoe excavations. Significant layers of clean coarse alluvium, which could rapidly convey significant amounts of groundwater, were likewise not observed. The results of slug testing performed on wells in and adjacent to proposed mining areas likewise suggest that the potential for rapid migration of groundwaters through alluvial sediments in proposed mining areas is low (Tables 7-8 and 7-9). These data and observations suggest that the flux of groundwater migrating through the alluvial sediments in proposed mining areas in Sink Valley (that could support down-gradient groundwater systems) is not large. Much of the groundwater migrating through the alluvial sediments in proposed mining areas (in the East ¼ of Section 30, T39S, R5W) likely leaves the groundwater system through diffuse discharge to the land surface and is lost evapotranspiration and does not contribute to the overall hydrologic balance in the area. In Sink Valley, a preferential pathway for alluvial groundwaters through deep coarse-grained alluvial sediments likely exists along the east side of Sink Valley. While the thickness of the alluvium in proposed mining areas in Sink Valley generally does not exceed 50 feet (and in many locations is much less), the alluvial sediments along the eastern side of Sink Valley adjacent to proposed mining areas range from about 120 to 140 feet. Of the total flux of groundwater through the alluvial groundwater systems in Sink Valley, most of the flux is likely through this coarse-grained portion of the system. The percentage of the total flux that migrates through clayey and silty alluvial sediments in proposed mining areas along the western flanks of Sink Valley is likely much less.

It should be noted that highly permeable strata were encountered from about 60 to 75 feet depth just above the bedrock interface at the SS well cluster (monitoring well SS-75; Table 7-2). This well is screened in an area of burned or eroded coal (the coal is absent) and consequently, mining will not occur at this location. The coal seam is present at the nearby C9 cluster area. Were mining operations to intercept this highly permeable zone, substantial groundwater inflows into the mine openings could occur. Consequently, prior to surface mining in this area, the boundary between the competent coal seam and the area of burned or eroded coal will be more precisely defined by drilling or other suitable techniques such that mine openings can be designed to avoid these areas of potentially large groundwater inflows.

As discussed in Section 722 above, alluvial groundwater from Sink Valley discharges to several springs and seeps and as diffuse discharge to the ground surface in the northwest ¼ of Section 32, T39S, R5W (see Drawing 7-4; groundwater discharge area B). This groundwater discharge is likely a result of the constriction in Sink Valley in this area and the corresponding decrease in the cross-sectional area of the alluvial sediments in the valley, which forces groundwater to discharge at the surface. Most of the groundwater discharge in this area is likely derived from the up-gradient alluvial groundwater systems in the eastern portion of the valley (i.e., the coarse-grained portion of the alluvial groundwater system), which is situated east of the proposed Coal Hollow Mine permit area. This conclusion is based on 1) the substantially larger cross-sectional area of the alluvium in the deeper eastern portion of the valley relative to that in proposed mining areas near the western margins of the valley, 2) the higher hydraulic conductivity of the sediments in the coarse-grained part of the alluvial system, and 3) the lack of other apparent discharge mechanisms for the coarse-grained system further downstream in Sink Valley Wash (i.e., there are no significant alluvial springs or seeps further downstream in Sink Valley Wash and the system apparently does not contribute measurable baseflow to Sink Valley Wash further downstream (at least at the surface in the stream channel, as evidenced by the lack of baseflow in the wash monitored at SW-9).

Because most of the alluvial groundwater discharge supporting springs and seeps in this area is likely not derived from groundwater systems that underlie planned mining areas in the proposed Coal Hollow Mine permit area, it is considered unlikely that discharges from the springs and seeps in northwest ¼ of Section 32 T39S, R5W will be appreciably diminished as a result of the proposed mining and reclamation activities. While considered unlikely, some temporary impacts to discharge rates from springs and seeps in this area are possible. In particular, it should be noted that mining in the southernmost portions of the proposed Coal Hollow Mine permit area has a somewhat greater potential to decrease groundwater discharge rates at spring SP-6, which is located about 600 feet below the southernmost proposed mining areas (Drawing 7-2). SP-6 is an alluvial seep which has been impounded with an earthen dam from which measurable discharge is generally not present.

It is critical to note that individual mine pits in this area will remain open for short lengths of time, generally no more than about 60 to 120 days. Mining operations in the vicinity near the alluvial groundwater discharge area in the northwest ¼ of Section 32

T39S, R5W are planned to be completed in about 1 year. Thus, any potential impacts to discharge rates from down-gradient groundwater systems will be short-lived. Following the backfilling and reclamation of mine openings, the potential for interception or re-routing of alluvial groundwater away from the groundwater discharge area in northwest ¼ of Section 32 T39S, R5W will be negligible. As stated above, most of the flux through the Sink Valley alluvial groundwater system that supports springs and seeps in the area occurs in the eastern portion of the valley, which will not be impacted by mining and reclamation activities. Consequently, long-term impacts to discharge rates from springs and seeps in this area are not anticipated. It should also be noted that if increased quantities of groundwater were to be encountered in mine workings in lower Sink Valley such that the water would need to be discharged to surface drainages, the mine water will ultimately be discharged to the Sink Valley Wash drainage (i.e., the water will remain in its drainage basin).

Alluvial groundwater systems in the Lower Robinson Creek area are much less extensive than the alluvial groundwater system in Sink Valley. Perched groundwater conditions exist locally in the alluvial groundwater system in the Lower Robinson Creek drainage. Other than the re-emergence of alluvial groundwater flowing beneath the Lower Robinson Creek stream channel where the stream channel exists directly on bedrock substrate, discharges from the alluvial groundwater system as springs or seeps in Lower Robinson Creek are not observed. Consequently, mining operations in the Lower Robinson Creek drainage will likely not result in diminution of down-gradient groundwater resources.

It should be noted that the proposed Coal Hollow Mine plan calls for the permanent diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the proposed diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of groundwater or surface-water resources, where required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

If any Utah State appropriated water rights are impacted by mining and reclamation operations in the proposed Coal Hollow Mine, these will be replaced according to all applicable Utah State laws and regulations using the designated water replacement source described in Section 727 above.

Draining of up-gradient groundwater resources

Where surface mining occurs adjacent to up-gradient groundwater systems, there is a potential that draining of groundwater from the up-gradient groundwater system into the mine voids could occur. This condition could occur if a sufficiently large and permeable stratum were to be intercepted that is in good hydraulic communication with the up-gradient groundwater system through which appreciable quantities of water could be transmitted.

To more fully evaluate the potential for draining of up-gradient groundwater resources, a field investigation was performed during the winter of 2006-2007 that was designed to facilitate the characterization of the alluvial groundwater system in the proposed Coal Hollow Mine permit and adjacent area. Specifically, this program was designed 1) to better define the vertical and lateral extent of permeable, coarse-grained sediments in the alluvial groundwater system, 2) to characterize the water bearing and water transmitting properties of alluvial sediments, and 3) to evaluate the degree of hydraulic communication between the coarse-grained portion of the alluvial system in Sink Valley and the clayey alluvial sediments in proposed mining areas.

This field investigation included 1) the drilling and installation of 30 monitoring wells, 2) the performance of a 28-hour pumping and recovery test on alluvial production well Y-61 with contemporaneous measuring of water levels in the monitoring well network and contemporaneous measuring of spring discharge rates at three alluvial springs, and 3) the slug testing of 20 monitoring wells to determine approximate values of hydraulic conductivity. The results of the field investigation including analysis of the data collected in the investigation are presented in Appendix 7-1 and are summarized below.

Other than occasional pebbles or small rocks, coarse-grained sediments (i.e., gravels and coarse sands) were not encountered in the drilling of wells along the eastern margins of proposed mining areas in Sink Valley (C1, C2, C3, and C4 well clusters). (It should be noted that the C2 well cluster is located west of the eastern limit of the mine disturbance. The mine openings will intercept the C2 well cluster and the area to the east to locations west of well Y-102). Rather, the sediments encountered in the drilling of these wells were dominated by clays and silts with subordinate amounts of fine-grained sand. Similarly, coarse-grained deposits were not encountered in well clusters C6, C7, C8, and C9. There was no indication during drilling of any appreciable thickness of highly permeable strata through which groundwater could rapidly be transmitted (although it should be noted that the presence of thin sand layers are difficult to identify in wet auger drilling returns). Similarly, appreciable amounts of high-permeability coarse-grained alluvial sediments were not noted in alluvial sediments investigated in backhoe excavated pits and erosional escarpments in Sink Valley.

The hydraulic heads measured in alluvial monitoring wells near proposed mining areas in Sink Valley (C2, C3, C4, C7, C8, and C9) did not indicate artesian pressures. Rather, marked upward or downward vertical hydraulic gradients were not observed in any of these areas and water levels were consistently within several feet of the ground surface.

The results of pump testing in the alluvial groundwater system demonstrate that the springs in the northwest ¼ of Section 29, T39S, R5W are in direct hydraulic communication with the coarse-grained alluvial groundwater system in which the pumping well Y-61 is screened. Discharge rates (or water levels at Sorensen Spring) measured at each of the four springs (SP-8, SP-14, SP-20, and Sorensen spring) monitored during the 28-hour pumping test responded to pumping at the well. Monitoring wells at clusters C2, C3, and C4 near the easternmost proposed mining areas

also showed small, muted responses, with declines measured in water levels during the 28-hour test ranging from about 0.05 to 0.10 feet. Other monitoring wells in proposed mining areas did not respond measurably to pumping at Y-61. It should be noted that after the pumping well was turned off at the end of the 28-hour pumping test, spring discharge rates and water levels in alluvial monitoring wells recovered to approximate pre-testing levels.

The results of slug testing of wells in the proposed Coal Hollow Mine and adjacent area are presented in Table 7-8. Using these hydraulic conductivity values together with measured thicknesses of saturated alluvial sediments determined during drilling, and hydraulic gradient values determined from water levels measured in monitoring wells, rates of estimated groundwater inflows to mine openings have been calculated using Darcy's Law (Table 7-9).

Darcy's Law may be expressed as.

$$Q = KIA$$

Where

Q	=	groundwater discharge rate
K	=	hydraulic conductivity
I	=	hydraulic gradient
A	=	cross-sectional area

The values listed in Table 7-9 are reported as inflow rates per 100 lineal feet of mine openings oriented perpendicular to the groundwater flow direction. Calculations at individual locations are adjusted for the thickness of the saturated alluvium at that location. For all calculations in Table 7-9, a gradient of 0.10 has been used, which is considered a conservative estimate for the alluvial groundwater system in the vicinity of the planned Coal Hollow Mine workings. It is important to note that while values for saturated aquifer thickness and local hydraulic gradient in the alluvial groundwater system can be determined relatively precisely, hydraulic conductivity values determined from slug testing methods are generally considered as order-of-magnitude estimates. Consequently, the information from Table 7-9 should be used for general purposes only. The estimated groundwater inflow rates presented in Table 7-9 suggest that copious, unmanageable amounts of alluvial groundwater will likely not be encountered. It should be noted, however, that alluvial sediments located east of the C2 well cluster may contain coarser grained sediments similar to those intercepted in well Y-102. Special mining protocols will be employed when mining in these and adjacent areas (pits 13-15; see Section 728.333) to minimize the potential for interception of large groundwater inflows.

As surface mining operations advance toward the alluvial groundwater discharge area in the northwest ¼ of Section 29, T39S, R5W (See Drawing 7-4; groundwater discharge area A), the information in Table 7-9 suggests that groundwater inflow rates in this area will be modest, generally on the order of a few tens of gallons per minute or less per 100

lineal feet of mine opening. However, it should be noted that, as discussed above, if mine openings in this area were to intersect a substantial thickness of coarse-grained alluvial material that was in good hydraulic communication with the coarse-grained alluvial system located along the eastern margins of Sink Valley, substantially greater rates of groundwater inflow could occur. Based on the information in Tables 7-8 and 7-9, this is not considered likely.

As mining operations advance toward the alluvial groundwater discharge area in the northwest ¼ of Section 29, T39S, R5W (See Drawing 7-4; groundwater discharge area A) and groundwater discharge from up-gradient alluvial groundwater systems occurs, there is the potential that discharge rates from alluvial springs in this area could be diminished. The magnitude of this potential impact will be largely dependent on the drainage rate and volume of groundwater that may be drained from the up-gradient alluvial groundwater system.

The potential for diminution of discharge from alluvial springs near proposed mining areas near the northwest ¼ of Section 29, T39S, R5W will be minimized because:

1) As mining progresses toward the groundwater discharge area in the northwest ¼ of Section 29, T39S, R5W (see Drawing 7-4, groundwater discharge area A), groundwater inflows into mine openings and discharge rates from the nearby alluvial springs will be closely monitored. If groundwater inflow rates into mine openings are excessive, where necessary Alton Coal Development, LLC will use a suitable technique to minimize groundwater inflow rates into the mine. These techniques may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to isolate and protect groundwater resources up-gradient of mining activities, and

2) Individual mine pits in the proposed Coal Hollow Mine will remain open for short lengths of time, generally no more than about 60 to 120 days. Consequently, any potential impacts to spring discharge rates in the alluvial groundwater system in this area will likely be short-lived. Because the alluvial groundwater recharge areas are located well up-gradient of proposed mining areas (mountain-front recharge) and will not be impacted, recharge to the alluvial system should continue uninterrupted, it is anticipated that water levels in the artesian groundwater system should recover from any mining-related declines in hydraulic head subsequent to the completion of mining in the area.

Groundwater discharge from the springs in the northwest ¼ of Section 29, T39S, R5W (See Drawing 7-4; groundwater discharge area A) do not contribute any measurable baseflow discharge to streams in the area. This conclusion is based on the lack of any baseflow discharge in streams down-gradient of this area in Sink Valley (see monitoring data for SW-6 and SW-9). Rather, most of this discharge is likely ultimately lost to evapotranspiration as the water migrates across the low-permeability, near-surface clayey sediments in Sink Valley. Consequently, the potential temporary diminution of discharge

from alluvial springs in the northwest ¼ of Section 29, T39S, R5W would not result in appreciable adverse impacts to the surrounding hydrologic balance.

If any Utah State appropriated water rights are impacted by mining and reclamation operations in the proposed Coal Hollow Mine, these will be replaced according to all applicable Utah State laws and regulations using the designated water replacement source described in Section 727 above.

728.320 Presence of acid-forming or toxic-forming materials

Chemical information on the acid- and toxic-forming potential of earth materials naturally present in the proposed permit area are presented in Appendix 6-2. Chemical information on the low-sulfur Smirl coal seam proposed for mining is presented in Appendix 6-1 (confidential binder). Based on laboratory analytical data, it is apparent that acid-forming and toxic-forming materials that could result in the contamination of surface-water or groundwater supplies in the proposed Coal Hollow Mine permit and adjacent area are generally not present.

Selenium was not detected in any of the samples from the proposed Coal Hollow Mine permit area. Likewise, concentrations of water-extractable boron were also low, being less than 3 mg/kg in all samples analyzed. The pH of groundwaters in and around the proposed Coal Hollow Mine permit area are moderately alkaline (UDOGM, 2007). Data in Appendix 6-2 likewise indicate moderately alkaline conditions in sediments in the proposed permit area. The solubility of dissolved trace metals is usually limited in waters with alkaline pH conditions. Consequently, high concentrations of these metal constituents in groundwaters and surface waters with elevated pH levels are not anticipated. Additionally, most of the materials that will be handled as part of mining and reclamation activities in the proposed Coal Hollow Mine area are of low hydraulic conductivity (i.e. clays, silts, shales, siltstones, claystones, etc.). Consequently, it is anticipated that groundwater seepage volumes through low-permeability backfill and reclaimed land surfaces in reclaimed mine pit areas and excess spoils storage areas will not be large. Additionally, reclaimed areas will be regraded, sloped, and otherwise managed to minimize the potential for land erosion, to restore approximate surface-water drainage patterns, and also to minimize the potential for ponding of surface waters on reclaimed areas (other than "roughening" or "gouging" of some areas to enhance reclamation). Thus, the potential for interactions between large amounts of disturbed earth materials and groundwaters and surface waters, which could result in leaching of chemical constituents into groundwater and surface-water resources, will be minimized.

Additionally, the mining plan calls for the emplacement of 40 inches of suitable cover material over backfilled areas made up of material types which could appreciably impact vegetation (materials with elevated SAR ratios or other physical or chemical characteristics that could adversely impact vegetation).

The neutralization potential greatly exceeded the acid potential in all samples analyzed, with the neutralization potential commonly exceeding the acid potential by many times, suggesting that acid-mine-drainage will not be a concern at the proposed Coal Hollow Mine. Acid-forming materials in western coal mine environments often consist of sulfide minerals, commonly including pyrite and marcasite, which, when exposed to air and water, are oxidized causing the liberation of H^+ ions (acid) into the water. Oxidation of sulfide minerals may occur in limited amounts in the mine pits where oxygenated water encounters sulfide minerals. However, the acid produced by pyrite oxidation is quickly consumed by dissolution of abundant, naturally occurring carbonate minerals (Appendix 6-2). Dissolved iron is readily precipitated as iron-hydroxide in well aerated waters, and consequently excess iron is not anticipated in mine discharge water.

Other acid-forming materials or toxic-forming materials have not been identified in significant concentrations nor are such suspected to exist in materials to be disturbed by mining.

Because of the overall low-permeability of the rock strata and sediments surrounding the mine workings (primarily the shales and claystones of the lower Tropic Shale), the potential for seepage of mine water outward into adjacent stratigraphic horizons is low. Additionally, because the floors of the mine pits need to be accessible in order to extract the coal, the mining operations will be carried out in such a manner that the accumulation of large amounts of water in the mine pits will be avoided.

728.331 Sediment yield from the disturbed area.

Erosion from disturbed areas will be minimized through the use of silt fences and other sediment control devices. Surface runoff occurring on disturbed areas will be collected and treated as necessary to remove suspended matter. Four diversion ditches along with four sediment impoundments are proposed for the permit area. In addition, miscellaneous controls such as silt fence and berms are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2.

The smallest practicable area, consistent with reasonable and safe mine operational practices will be disturbed at any one time during the mining operation and reclamation phases. This will be accomplished through progressive backfilling, grading, and prompt revegetation of disturbed areas. The backfilled material will be stabilized by grading to promote a reduction of the rate and volume of runoff in accordance with the applicable requirements. The excess spoil and fill above approximate original contour will be graded to a maximum 3h:1v slope and revegetated to minimize erosion.

Cut ditches will be established on the shoulders of all primary roads to control drainage and erosion. Cut and fill slopes along the primary roads will be minimal and are not

expected to cause significant erosion. In locations where there are culvert crossings (i.e. Lower Robinson Creek), the fills slopes will be stabilized by utilizing standard methods such as grass matting or straw wattles. The location and details for roads can be viewed on Drawings 5-3 and 5-22 through 5-24.

Through the implementation of these sediment control measures, it is anticipated that sediment yield from disturbed areas in the proposed Coal Hollow Mine permit area will be minimized.

728.332 Impacts to important water quality parameters

As discussed above, appreciable quantities of groundwater are not anticipated to be intercepted in the Tropic Shale overlying proposed mining areas. Consequently, discharge of Tropic Shale groundwaters from mining areas is not anticipated. Because of the very low hydraulic conductivity of the marine Tropic Shale unit which immediately overlies the coal in proposed mining areas, the lateral migration of appreciable amounts of groundwater outward from proposed mine pit areas is not anticipated. Therefore, no impacts to important water quality parameters in surrounding groundwater and surface-water resources that could result from the interception of Tropic Shale groundwaters are anticipated.

Similarly, appreciable quantities of groundwater are not expected to emanate from the Dakota Formation in the mine floor into the mine openings. This conclusion is based on the fact that 1) vertical and horizontal groundwater flow in the Dakota Formation is impeded by the presence of low-permeability shales that encase the interbedded lenticular sandstone strata in the formation (i.e., the formation is not a good aquifer), 2) appreciable natural discharge from the Dakota Formation in the surrounding area to springs or streams is not observed, supporting the conclusion that the natural flux of groundwater through the formation is meager, and 3) mining will commence near the truncated up-dip end of the formation, minimizing the potential for elevated hydraulic head in the Dakota Formation. The results of slug testing performed on wells screened in the Smirl coal seam indicate relatively low values of hydraulic conductivity for the coal seam (Table 7-8). In much of the proposed mining area, the coal seam is dry. Thus, large inflows of groundwater from the coal seam into mine workings are not anticipated. Likewise, the potential for seepage out of mine pits through the coal seam is minimal. Consequently, impacts to important water-quality parameters in the Dakota Formation potentially resulting from mining operations are not anticipated, nor are impacts to important water-quality parameters in surrounding groundwater and surface-water systems anticipated as a result of interactions with intercepted Dakota Formation groundwater.

The water quality of groundwaters in the alluvial groundwater system up-gradient of mining operations will likely not be impacted by mining and reclamation activities in the proposed Coal Hollow Mine. Were alluvial groundwaters intercepted by mine openings allowed to flow into the mine pits, there would be the potential for substantially increased

TDS concentrations as the water interacts with the marine Tropic Shale and the Smirl coal seam. This occurrence will be avoided.

As groundwater naturally migrates through the shallow, fine-grained alluvial sediments in the proposed Coal Hollow Mine permit and adjacent area (most evident in Sink Valley), the quality of the water is naturally degraded (see Appendix 7-1). In the distal portions of Sink Valley, most notably concentrations of magnesium, sulfate, and bicarbonate are elevated in the alluvial groundwater.

The potential for TDS increases associated with interaction of waters with the Tropic Shale can be minimized by avoiding contact where practical between water sources and earth materials containing soluble minerals. Where possible, groundwater that will be encountered in alluvial sediments along the margins of mine pit areas will be routed through pipes, ditches or other conveyance methods away from mining areas via gravity drainage so as to prevent or minimize the potential for interaction with sediments disturbed by mining operations (including contact with the mined coal seam). If diverted alluvial groundwater were allowed to interact extensively with the Tropic Shale bedrock or Tropic Shale-derived alluvial sediments, similar increases in magnesium, sulfate, bicarbonate, and TDS concentrations would be anticipated. Consequently, where intercepted groundwaters will be routed around disturbed areas through pipes or well-constructed and maintained ditches, it is anticipated that detrimental impacts to important water quality parameters in these waters will be minimal.

The pumping and discharging of mine water from mine pits at the proposed Coal Hollow Mine permit area is not anticipated. The impoundment of substantial quantities of water within the mine pits would likely result in degradation of groundwater quality and is also not compatible with the proposed surface mining technique (the coal extraction operations occur at the bottom of the mine pit and thus they cannot be performed in flooded mine pits). As discussed above, the only likely foreseeable source of appreciable quantities of groundwater is from the alluvial groundwater systems overlying the low-permeability Tropic Shale in proposed mining areas. Where this alluvial groundwater is encountered in mining areas, it will be diverted away from mine workings prior to significant interaction with sediments in disturbed areas. Any discharge from the mine pits that does occur will be regulated under a Utah UPDES discharge permit.

Acid mine drainage is not anticipated at the proposed Coal Hollow Mine permit area. This is due primarily to the relatively low sulfur content of the coal (see Appendix 6-1; confidential binder) and rock strata in the permit and adjacent area, and to the pervasiveness of carbonate minerals in the soil and rock strata which neutralize the acidity of the water if it occurs. If sulfide mineral oxidation and subsequent acid neutralization via carbonate dissolution were to occur, increases in TDS, calcium, magnesium, sulfate, and bicarbonate concentrations (and possibly also sodium concentrations via ion-exchange with calcium or magnesium on exchangeable clays) would be anticipated.

An analysis of the acid/base potential of samples collected from the overburden and underburden in the proposed mining area indicates that acid mine drainage will be unlikely to occur at the Coal Hollow Mine. The results of laboratory analysis of the acid/base potential of samples collected from the overburden, underburden, and Smirl coal zone are presented in Appendix 6-2. None of the overburden or underburden samples were acid forming, as each of the intervals sampled showed excess neutralization potential. Taken as a whole, the un-weighted composite average acid/base potential of the 57 overburden and underburden samples indicates a net neutralization potential of 174 tons per kiloton. The neutralization potential of the composite overburden/underburden (180 tons per kiloton) exceeds the acid potential (5.5 tons per kiloton) by more than 32 times. A general consensus opinion mentioned by the National Mine Land Reclamation Center (OSM, 1998) is that if the net acid/base potential exceeds 30 tons per kiloton, and the ratio of neutralization potential to acid potential exceeds two, then *alkaline* water will be generated and acid mine drainage will not occur. The acid/base characteristics of composite overburden and underburden in the Coal Hollow Mine area greatly exceed both of these two criteria, suggesting the strong likelihood that acid mine drainage will not be an issue at the Coal Hollow Mine.

Because of the net neutralization potential of the composite overburden/underburden in the Coal Hollow Mine area described above, the pH values of groundwater in fill areas will likely be neutral to alkaline. Accordingly, the solubility of dissolved trace metal species in the alkaline water will likely be low. Consequently, the potential for the mobilization and transport of trace metals in groundwater in the fill will likely also be low. Concentrations of total selenium, water extractable selenium, water extractable boron and other important chemical species in the overburden samples from the Coal Hollow Mine area are generally low. Water extractable selenium concentrations in the analyzed Dakota Formation underburden samples range from 0.05 to 0.2 mg/kg (see Appendix 6-2). Water extractable boron concentrations in the Dakota Formation underburden in a single location (CH-08; 6.5 mg/kg) marginally exceed the Division standard of 5 mg/kg. The limited quantities of material containing water extractable selenium and boron in these concentration ranges in backfill materials are not anticipated to result in appreciably elevated selenium or boron concentrations in groundwater or surface water supplies. Because the hydraulic conductivity of the composite run-of-mine backfill material (which will be rich with clays, silts, and shale) is expected to be low, the flux of groundwater that might migrate through the backfilled pit areas is likely to be low. Additionally, the reclaimed land surface will be graded to promote runoff of surface waters overlying backfilled areas, thus minimizing the potential for infiltration of surface waters into backfilled areas. Consequently, the potential for acid mine drainage or toxic drainage from backfilled areas to surrounding groundwater and surface-water supplies will be minimized.

As outlined in the topsoil and subsoil sampling plan in Chapter 2 of this MRP, materials with poor quality SAR, elevated selenium or boron concentrations, or poor pH as defined by Division guidelines will not be placed in the upper four feet of the reclaimed surface. These materials will also not be placed in the backfill within the top four feet of ephemeral drainages with 100 year flood plains, or in the top four feet in surface water

impoundments, or in the top four feet in intermittent or perennial drainages including 100 year flood plains as outlined in the Division guidelines. Materials placed in the top four feet will be sampled to ensure that only suitable materials are placed in the top four feet of the reclaimed surface.

It is noteworthy that in the neighboring state of Wyoming, a water extractable selenium standard of 0.3 mg/kg is considered suitable for topsoil and topsoil substitutes, with concentrations ranging from 0.3 to 0.8 mg/kg being considered marginally suitable for topsoil and topsoil substitute.

As is typical with coal seams regionally, laboratory analyses of coal samples from the Coal Hollow Mine area indicates that there is a net acid forming potential in the coals of the Smirl coal zone (see Appendix 6-2). However, the mining plans call for the mining and removal of 95% of the total coal seam thickness from mining areas, leaving only minor amounts of coal in backfilled areas. Consequently, the potential contribution to the overall acid/base potential of the composite backfill material would be small. Assuming a worst-case-scenario – that all the coal would be retained in the backfill material – the calculated acid/base potential of the composite backfill material is still well within the limits suggested by OSM (1998) to indicate that alkaline discharge without acid mine drainage would be likely.

As described in Chapter 5, Section 532, surface runoff that occurs on disturbed areas will be treated through sedimentation ponds or other sediment-control devices and particulate matter will be allowed to settle prior to the discharging of the water to the receiving water, thus controlling suspended solids concentrations.

At any mining operation there is the potential for contamination of soils, surface-water and groundwater resources resulting from the spillage of hydrocarbons. Diesel fuels, oils, greases, and other hydrocarbons products will be stored and used at the mine site for a variety of purposes. A spill Prevention Control and Countermeasure Plan will be implemented that will help minimize any potential detrimental impacts to the environments.

Spill control kits will be provided on all mining equipment and personnel will be trained to properly control spills and dispose of any contaminated soils in an appropriate manner.

Based on these findings, it is concluded that the potential for mining and reclamation activities in the proposed Coal Hollow Mine permit area to cause detrimental impacts to important water quality parameters is minimal.

728.333 Flooding or streamflow alteration

As described above, appreciable groundwater inflow from the Tropic Shale and Dakota Formation into mine pits at the proposed Coal Hollow Mine are not anticipated. Appreciable groundwater inflows are anticipated only from the relatively thin, overlying

alluvial groundwater systems. The thicknesses of the alluvium adjacent to mine openings in the proposed mining areas is generally less than 40 to 50 feet. The hydraulic conductivities of the predominantly clayey and silty alluvial sediments are low, and consequently, very large or sudden groundwater inflows into mine openings are not anticipated. Where appreciable alluvial groundwater is encountered adjacent to mine openings, it will be routed away from mining areas through ditches of other conveyance mechanisms. Consequently, discharge of mine water from the mine pits is not anticipated. The rates of alluvial groundwater drainage that could occur will likely not be of a magnitude that could potentially cause flooding or streamflow alteration in either the Sink Valley Wash or Lower Robinson Creek drainages.

If excess groundwater were to be encountered during mining operations such that it could not be adequately managed or discharged in compliance with the Utah UPDES discharge permit (which is considered unlikely), Alton Coal Development, LLC may when necessary construct supplemental containment and settlement ponds in which mine discharge waters may be held for treatment (where necessary) and subsequent discharge through UPDES discharge points in compliance with the UPDES discharge permit, minimizing the potential for flooding or streamflow alteration in areas adjacent to mining. To ensure that the mine is able to deal with any unforeseen

When coal mining near the eastern edge of the Coal Hollow Mine permit area occurs (mine pits 13-15), special measures will be taken to minimize the potential for the interception by the mine openings of large quantities of groundwater from artesian groundwater system in the northwest ¼ of Section 29, T5W, R39S, and to adequately deal with groundwater inflows if such occur.

When mining operations advance toward the eastern edge of the permit boundary in pits 13, 14, and 15, material excavating in the alluvial sediments will be performed incrementally and with caution. As excavation proceeds, if coarse, water-bearing alluvial sediments (gravels) are encountered, overburden removal in that area will be stopped. The excavation equipment operator will recover the exposed gravel zone with local impermeable sediments (abundant in the alluvium in the area) to halt groundwater inflow if possible. The hydrogeologist will be called to the site to access the hydrogeologic conditions. An investigation of the situation will be performed and a suitable work plan will be developed prior to the resumption of overburden removal in that area. The work plan will be designed to minimize the potential for intercepting unacceptably large inflows of groundwater into the mine pits. The work plan will most likely involve trenching in the alluvium in zones up-gradient of the mine pit area and the emplacement of a low-permeability cut-off wall. The cut-off wall would be emplaced in the excavated trench using bentonite or other acceptable native low-permeability materials. The cut-off wall would be designed to isolate the mine openings from the coarse-grained alluvial groundwater system sufficient to decrease mine inflows to acceptable levels (i.e. so as to minimize the potential for detrimental impacts to the hydrologic balance and to minimize the potential for flooding of mine pits or causing flooding or stream alteration).

As a temporary measure to manage any potential large groundwater inflows that may occur in these areas prior to the installation of a suitable up-gradient hydraulic barrier, the intercepted alluvial groundwaters would be routed along mine benches that "daylight" to the natural land surface in areas to the south. The water would be diverted into pond 4 which has an appreciable storage capacity and discharge structure.

It should be noted that the interception of moderate amounts of groundwater from shallow alluvial groundwater systems in these areas is considered likely. Modest inflows of shallow groundwater intercepted by the mine workings in these areas would be manageable and not of significant concern. The objective of the work plan would be to ensure that strong hydrodynamic communication between the coarse-grained artesian alluvial groundwater systems in the eastern portion of Sink Valley with the Coal Hollow Mine workings is not established.

The rate at which alluvial groundwater will be intercepted by the proposed Coal Hollow Mine will be variable by location and time in permit area. Because of the heterogeneity inherent in most alluvial deposits, the quantifying of precise aquifer parameters in the various mining areas is not straightforward. Additionally, the geometry of the mine openings including the horizontal lengths and heights of mine pit faces adjacent to saturated groundwater systems that are exposed at any point in time are dynamic variables in the surface mining environment. Consequently, precise quantifications of mine groundwater interception rates are not readily obtainable. However, using the estimated mine pit groundwater inflow rates presented as discharge per linear foot of open pit in Table 7-9, it is considered likely that mine interception will be on the order of a few tens of gallons per minute in dry areas and at times when open pit sizes are small, to several hundred gallons per minute in wetter areas and at times when the open pit size is large. It is important to note that inflows into individual pit areas will be short lived, as the individual pits will commonly remain open for a few weeks to a few months.

The reasonably foreseeable maximum quantity of water that could be intercepted by the Coal Hollow Mine is largely a function of the manner in which coal mining operations are conducted in areas where the potential for encountering appreciable groundwater inflows is greatest. If large areas of water-bearing coarse-grained sediments were to be rapidly exposed in mine pit areas, large quantities of water would be anticipated (likely several thousands of gallons per minute). However, as described above, mining operations will be carried out in these areas using the special mining protocols described above. Consequently, large cross-sectional exposures of water-bearing coarse-grained alluvial sediments will not be allowed to be exposed to the mine pits and large inflows of groundwater on that magnitude are not anticipated.

In the unanticipated event that excessive quantities of water were to flow into the mine pits by any mechanism, the water would be pumped from the pits using a suitable pump and piping equipment that will be located on-site at the Coal Hollow Mine for such a contingency. Such water would be managed appropriately as required by all applicable State and Federal regulations. It should be noted that it is not in the mine's interest to allow excessive water to flow into the mine pits. All reasonable efforts will be taken to

minimize the potential for flooding of the mine pits (an event that is not considered reasonably foreseeable or probable to occur).

Through the implementation of the above described mining protocols in areas where potentially large groundwater inflows could reasonably be anticipated to occur, the potential for the interception of large quantities of water by the mine is minimized. Consequently, the potential for flooding or streamflow alteration that could occur as a result of intercepting and discharging large quantities of water will be minimized and is considered unlikely.

The principal surface-water drainages in and adjacent to the proposed Coal Hollow Mine permit area are in many locations not stable in their current configurations (see photograph section). Currently, these stream drainages are actively eroding their channels during precipitation events, resulting in down-cutting and entrenchment of stream channels, the formation of unstable near-vertical erosional escarpments adjacent to stream channels (which occasionally spall off into the stream channel), aggressive headward erosion of stream channels and side tributaries, and the transport of large quantities of sediment associated with torrential precipitation events. These processes are currently actively ongoing in the proposed permit and adjacent area and the upper extents of these erosional processes are in many locations migrating upward in stream channels, resulting in increasing lengths of unstable stream channels.

Hereford (2002) suggests that the valley fill alluviation in the southern Colorado Plateau occurred during a long-term decrease in the frequency of large, destructive floods, which ended in about 1880 with the beginning of the historic arroyo cutting. Hereford (2002) further suggests that the shift from deposition to valley entrenchment coincided with the beginning of an episode of the largest floods in the preceding 400-500 years, which was probably caused by an increased recurrence and intensity of flood-producing El Nino Southern Oscillation events beginning at ca. A.D. 1870.

The exact causes of the entrenchment of stream channels and the creation of the numerous arroyos currently in existence in the southwestern United States are not completely understood. Vogt (2008) suggests that three primary factors resulted in the arroyo formation. These factors included 1) changes in climate that produced heavy rainfall, 2) land-use practices such as livestock grazing, and 3) natural cycles of erosion and deposition caused by internal adjustments to the channel system. The temporal coincidence of the causes may have magnified the effect of each factor.

Each of these factors likely contributed to the formation of the entrenched stream drainages and arroyos in the Coal Hollow Project area. Gregory (1917) states that historical evidence indicates that the cutting of Kanab Creek began when a large storm occurred on 29 July 1883, and that unusually large amounts of precipitation were received in 1884-85. In this period the Kanab Creek channel was down-cut by 60 feet and widened by 70 feet for a distance of about 15 miles. The lowering of Kanab Creek may have resulted in a lowering of the local base level and consequent incision of both Sink Valley Wash and Lower Robinson Creek. As suggested by Vogt (2008), other

factors, such as the heavy livestock grazing in the local area, which was occurring contemporaneously with the heavy thunderstorm events, likely also contributed to the overall conditions that brought about the stream down-cutting episode in the late 1800s.

While the precise sequence of events and conditions that triggered the arroyo formation and stream entrenchment in the principle surface drainages in and adjacent to the Coal Hollow Project area is not known, it is readily apparent that the principle surface water drainages are not currently in a condition of equilibrium. Stream head-cutting (headward erosion), bank erosion, and spalling of the steep stream channel walls are ongoing processes in the Coal Hollow Project area.

The mining and reclamation plan for the Coal Hollow Mine has been designed to minimize the potential for sediment yield and erosion in the mine permit area. Accordingly, the mining and reclamation plan minimizes the potential for stream channel erosion and instability within the permit area. No mining-related activities are planned that would likely result in a worsening of the current instability of the surface water drainages in the permit and adjacent area.

The Coal Hollow Mine mining and reclamation plan calls for reclamation activities concurrent with mining progression, which results in the smallest disturbed area footprint and minimizes the length of time that the land surface is susceptible to erosion. The plan also calls for soil tackifiers to be used as a temporary soil stabilizer on reclamation areas prior to seeding. Seeded areas will be mulched. Vegetation established in final reclamation areas will minimize the potential for sediment yield and stream erosion in the long term.

The potential for erosion on the planned excess spoils pile will likewise be minimized. The design plans for the excess spoils pile call for the side slopes exceeding 60 feet in height to be constructed with concave slopes to promote slope stability and to minimize the erosion potential. The excess spoils pile will also be revegetated to minimize the erosion potential.

The Lower Robinson Creek reconstruction will likewise be constructed to promote stability and resistance to erosion. Details of the Lower Robinson Creek reconstruction are shown on Drawings 5-20A and 5-21A. The construction of the channel will include riprap of the channel bottom and the inclusion of an inner flood plane to minimize erosion during flooding events. The stream channel will be revegetated to minimize erosion potential. The Lower Robinson Creek reconstruction is designed to leave the drainage in a condition at final bond release that is at least as stable as the current pre-mining condition.

Following reclamation, stream channels will be returned to a stable state to the extent possible given the currently unstable state of natural drainage channels in the area. Stream channels will be designed to withstand anticipated storm events, thus minimizing the potential of flooding in the reclaimed areas.

The overall condition of the land surface and the surface-water drainages within the permit area at final bond release will likely meet or exceed the current pre-mining conditions. However, it should be noted that Alton Coal Development, LLC will have no control over the land management practices and landowner activities that may be implemented on the privately owned lands of the reclaimed Coal Hollow Mine area after final bond release. Accordingly, the degree of erosional stability and overall conditions in the reclaimed lands and stream drainages in the post bond-release period is not in the control of Alton Coal Development, LLC.

The existing principle surface-water drainages adjacent to the proposed Coal Hollow Mine permit area have large discharge capacities (lower Sink Valley Wash below the County Road 136 crossing, Lower Robinson Creek, and Kanab Creek). These drainages periodically convey large amounts of precipitation runoff water associated with torrential precipitation events. The anticipated discharge rates from alluvial groundwater drainage and the maximum reasonably foreseeable amount of mine discharge water that could potentially be required to be discharged from mine pits is much less than that periodically occurring during major torrential precipitation events. The addition of modest amounts of sediment-free water into these stream channels has the potential to cause minor increases in channel erosion. However, the magnitude of this potential impact will likely be small relative to that occurring during torrential precipitation events.

Most precipitation waters falling on disturbed areas will be contained in diversion ditches and routed to sediment impoundments that are designed to impound seasonal water and storms. Sediment control facilities will be designed and constructed to be geotechnically stable. This will minimize the potential for breaches of sediment control structures, which if they occur could result in down-stream flooding and increases in stream erosion and sediment yield. Emergency spillways will be part of the impoundment structures to provide a non-destructive discharge route should capacities ever be exceeded.

Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2.

It should be noted that during the startup and construction phase of the mine operation, while the ditches and sediment control ponds are being constructed, temporary silt control measures will be utilized. These measures may include the use of silt fences or other appropriate sediment control measures as necessary.

As shown on Drawing 5-26, there are two sediment impound watershed areas within the mine permit area (Watershed 5 and Watershed 6) from which precipitation runoff water will not be routed through sediment ponds.

Watershed 5 area includes 28 acres near the Sink Valley Wash/Lower Robinson Creek drainage divide. The land surface in Watershed 5 is relatively flat, sloping at about a one percent grade. Because of the flatness of the land surface in Watershed 5, it is not practical to construct ditches to convey water from this area to a sediment pond. Consequently, control of sediment in runoff water from Watershed 5 will be

accomplished through the use of a silt fence or other appropriate sediment control measure placed along the western permit boundary adjacent to Watershed 5 (see Drawing 5-26). Precipitation water falling on Watershed 5 will be retained as soil moisture, retained in the lowest portions of the watershed and allowed to evaporate or infiltrate or, after treatment with silt fences or other appropriate sediment control measures, allowed to flow down gradient onto lower lying adjacent areas.

Watershed 6 includes 19 acres located within the permit boundary east of the proposed Lower Robinson Creek reconstruction (see Drawing 5-26). The land surface in this area slopes gently toward the west at an approximately three to four percent grade. The Watershed 6 area will be isolated from a sediment pond by the reconstructed Lower Robinson Creek stream channel. Control of sediment in Watershed 6 will be accomplished through the installation of a silt fence or other appropriate sediment control measure along the margin of the watershed as shown on Drawing 5-26. The soils on the post-mining land surface in Watershed 6 will initially be stabilized with the use of tackifiers. Subsequent revegetation of the land surface in Watershed 6 will minimize the potential for erosion. After treatment with silt fences or other appropriate sediment control measures, precipitation water falling on Watershed 6 will be allowed to flow down-gradient toward adjacent lands or toward the Lower Robinson Creek stream channel.

The potential for flooding or streamflow alteration resulting from mining and reclamation activities at the proposed Coal Hollow Mine permit area is considered minimal.

728.334 Groundwater and surface water availability

Groundwater use in the proposed Coal Hollow Mine permit and adjacent area is generally limited to stock watering and domestic use in Sink Valley. Some limited use of spring discharge water for irrigation has occurred in Sink Valley, although such irrigation is not occurring presently nor has it occurred in at least the past 10 years. The areas of groundwater use in the proposed Coal Hollow Mine permit and adjacent area are located in the northwest ¼ of Section 29, T39S, R5W (see Drawing 7-4; groundwater discharge area A), and in the northwest ¼ of Section 32, T39S, R5W (see Drawing 7-4; groundwater discharge area B). The likely future availability of groundwater in each of these areas is discussed below.

Groundwater discharge area A (Northwest ¼, Section 29, T39S, R5W)

Groundwater use in area A occurs from several alluvial springs and seeps that are used for stock watering and limited domestic use. As described in Section 728.311 above, short-term diminution in discharge rates from springs in northwest ¼ of Section 29, T39S, R5W are possible as mining operations advance toward these springs. This potential impact is associated with the possible drainage of up-gradient alluvial groundwater into mine openings as mining advances toward groundwater discharge area

A. Because individual mine pits will typically remain open for less than about 60 to 120 days before subsequently being backfilled and reclaimed, the potential for long-term drainage of alluvial groundwater into the mine voids is negligible, and thus any potential decreases in alluvial discharge in groundwater discharge area A is anticipated to be short-lived.

If groundwater inflow rates into mine openings in this area are excessive, such that appreciable impacts to the springs and seeps in groundwater discharge area A are likely, where necessary Alton Coal Development, LLC will use a suitable technique to minimize groundwater inflow rates into the mine voids. These techniques may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to isolate and protect groundwater resources up-gradient of mining activities. Consequently, the potential that groundwater could become unavailable in this area is minimal. Additionally, if alluvial groundwater resources were to become unavailable in this area due to mining and reclamation activities in the proposed Coal Hollow Mine permit area, groundwater will be replaced according to all applicable State laws and regulations using the replacement water source described in Section 727 above.

It should be noted that the proposed water replacement source, water well Y-61, produces water from the coarse-grained alluvial groundwater system in Sink Valley. Nearby springs that could potentially be impacted by mining and reclamation activities are supported by the same alluvial groundwater system. However, while modest decreases in the artesian hydraulic pressures in the alluvial groundwater system could potentially result in diminution of spring flows, water well Y-61 is 150 feet deep and will be equipped with an electric well pump providing the capability to produce groundwater from the alluvial system even if the hydraulic head in the alluvial groundwater system were to be diminished such that artesian flow conditions temporarily ceased to exist.

Groundwater discharge area B (Northwest ¼, Section 32, T39S, R5W)

Groundwater use in groundwater discharge area B occurs at alluvial springs and seeps located southeast of the proposed Coal Hollow Mine permit area that are used for stock watering and limited domestic use. As described in Section 728.311 above, although some temporary and short-lived diminution in discharge rates from springs in northwest ¼ of Section 29, T39S, R5W is possible, this potential impact is not considered likely.

In the event that alluvial groundwater resources were to become unavailable in this area due to mining and reclamation activities in the proposed Coal Hollow Mine permit area, groundwater will be replaced according to all applicable State laws and regulations using the replacement water source described in Section 727 above.

Surface-water availability

Surface-water use in the proposed Coal Hollow Mine permit and adjacent area occurs in the Sink Valley Wash drainage and in Lower Robinson Creek. Surface waters in the Sink Valley Wash drainage (primarily from Water Canyon via an irrigation diversion and from Swapp Hollow; appreciable discharge in Sink Valley Wash below Section 29 T39S, R5W is usually absent) are utilized for both stock watering and limited irrigation use. Stream water in the Sink Valley Wash drainage is derived from runoff from the adjacent Paunsaugunt Plateau area. Because the surface water in the drainage originates from areas up-gradient areas located large distances from proposed mining areas, and because the stream channel is entirely outside the permit area and will not be impacted by mining and reclamation activities, there is essentially no probability that surface water availability in the Sink Valley Wash drainage could become unavailable as a result of mining and reclamation activities.

Discharge in Lower Robinson Creek immediately above the proposed Coal Hollow Mine permit area typically occurs only in direct response to significant precipitation or snowmelt events. Thus, surface-water availability is currently limited in this drainage prior to any mining activities.

Seepage of alluvial groundwater into the deeply incised lower Robinson Creek stream channel occurs near the contact with the underlying Dakota Formation in the southeast quarter of Section 19, T39S, R5W. This water is likely related to saturated alluvial deposits directly underlying the Robinson Creek stream channel and emerges near where the stream channel intersects the alluvial groundwater system. This seepage of alluvial water is usually about 5 - 10 gpm or less and is routinely monitored at monitoring station SW-5 (Drawing 7-2).

It should be noted that the proposed Coal Hollow Mine plan calls for the permanent diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the proposed diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of the meager discharge of surface water in the drainage below the planned diversion, where required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

The information presented above suggests that the potential for significant impacts to groundwater and surface-water availability resulting from mining and reclamation activities in the proposed Coal Hollow Mine permit and adjacent systems in the region is low.

728.340 Whether mining and reclamation activity will result in contamination, diminution or interruption of State-appropriated waters

State appropriated water rights in the proposed Coal Hollow Mine permit and adjacent area are shown on Drawing 7-3 and tabulated in Appendix 7-3.

Appropriated groundwaters include alluvial springs and seeps in the northwest ¼ of Section 29, T39S, R5W (groundwater discharge area A), springs and seeps in the northwest ¼ of Section 32, T39S, R5W (groundwater discharge area B). State appropriated surface waters include reaches of Sink Valley Wash east of the proposed Coal Hollow Mine permit area, and reaches of Lower Robinson Creek.

The potential for mining and reclamation activities at the proposed Coal Hollow Mine permit area to result in contamination, diminution or interruption of State-appropriated water in the proposed Coal Hollow Permit and adjacent area are described in detail in Sections 728.310, 728.320, 728.332, and 728.334.

With the possible exception of short-term diminution in discharge rates from springs and seeps in the northwest ¼ of Section 29, T39S, R5W, Contamination, diminution, or interruption of State-appropriated waters in the proposed Coal Hollow Mine permit and adjacent area are not anticipated. It should be noted that if groundwater inflow rates into mine openings in this area are excessive, such that appreciable impacts to the springs and seeps in groundwater discharge area A are likely, where necessary Alton Coal Development, LLC will use a suitable technique to minimize groundwater inflow rates into the mine voids. These techniques may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to isolate and protect groundwater resources up-gradient of mining activities, minimizing the potential for diminution of discharge rates from these springs.

Additionally, it should be noted that the proposed Coal Hollow Mine plan calls for the permanent diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the proposed diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of the meager discharge of surface water in the drainage below the planned diversion, where required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

In the event that any State appropriated waters were to be contaminated, diminished, or interrupted due to mining and reclamation activities in the proposed Coal Hollow Mine permit area, groundwater will be replaced according to all applicable State laws and regulations using the replacement water source described in Section 727 above.

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730 OPERATION PLAN

Coal mining in the proposed Coal Hollow Mine permit area will occur using surface mining techniques. All coal mining and reclamation operations will be conducted to minimize disturbance to the hydrologic balance within the permit and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area and support approved postmining land uses in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302. Operations will be conducted to assure the protection or replacement of water rights in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.

In order to maximize the use and conservation of the coal resource, coal will be recovered using large hydraulic backhoes or front end loaders and off-road trucks. Mined coal will be hauled to a central coal processing area for crushing and placement into a stockpile. Coal from the stockpile will be transferred into a bin and loaded into over the road trucks for transport.

The plan, with Drawings, cross sections, narrative, descriptions, and calculations indicates how the relevant requirements will be met. The lands subject to coal mining and reclamation operations over the estimated life of the operations are identified and briefly described. All appropriate information is located in the subsequent sections and Drawings 5-1 through 5-39 and Appendices A5-1 through A5-3.

731 GENERAL REQUIREMENTS

Operations will be conducted to assure protection or replacement of water rights in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.

Groundwater and Surface-Water Protection

To protect the hydrologic balance, coal mining and reclamation operations will be conducted to handle earth materials and runoff in a manner that minimizes acid, toxic, or other harmful infiltration to the groundwater system. Additionally, excavations, and disturbances will be managed to prevent or control discharges of pollutants to the groundwater.

Products including chemicals, fuels, and oils used in the mining process will be stored and used in a manner that minimizes the potential for these products entering groundwater systems. Concrete oil and fuel containments will be constructed as shown on Drawings 5-3 and 5-8.

The wash bay at the mine site will include a closed circuit water recycle system. This system will eliminate and store water impurities and reroute water back through the wash bay for cleaning equipment, thus minimizing water consumption the potential for contamination of groundwater resources. Details for this structure can be viewed on Drawings 5-3, and 5-8.

As mining operations approach springs and seeps in the northwest ¼ of Section 29, T39S, R5W (See Drawing 7-4; groundwater discharge area A), there is the potential for drainage of up-gradient into mine openings to cause short-lived diminution of discharge from these springs. If groundwater inflow rates into mine openings in this area are excessive, such that appreciable impacts to the springs and seeps in groundwater discharge area A are likely, where necessary Alton Coal Development, LLC will use a suitable technique to minimize groundwater inflow rates into the mine voids. These techniques may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to isolate and protect groundwater resources up-gradient of mining activities, minimizing the potential for diminution of discharge rates from these springs.

The mine will replace loss of water identified for protection in this MRP that are impacted by mining and reclamation operations.

To protect the hydrologic balance, coal mining and reclamation operations will be conducted to handle earth materials and runoff in a manner that minimizes acidic or toxic drainage, prevents to the extent possible, additional contributions of suspended solids to streamflow outside the permit area and otherwise prevents water pollution. Runoff and sediment control measures are described in detail in Chapter 5 of this MRP. The mine will maintain adequate runoff- and sediment-control facilities to protect local surface waters.

Discharge of mine water that has been disturbed by coal mining and reclamation operations is not anticipated. However, any discharges of water from areas disturbed by coal mining and reclamation operations that do occur will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U.S. Environmental Protection Agency set forth in 40 CFR part 434. Discharge of mine waters will be regulated by a Utah UPDES discharge permit.

Water pollution associated with mining and reclamation activities within the permit areas will be controlled by:

- Construction of berms and/or diversion ditches to control runoff from all facilities areas.
- Roads will be constructed with ditches to capture runoff
- Diversion ditches will be constructed as necessary around active mining and reclamation areas to capture runoff from those areas.

- Sedimentation impoundments will be constructed to control discharges
- In areas where impoundments or diversions are not suitable to the surrounding terrain, silt fence or straw bales will be utilized to control sediment discharge from the permit area.

In order to accomplish these objectives, watershed analysis of the permit and adjacent areas has been completed and specific designs are established for each water pollution control structure. Primary control structures include four sediment impoundments, four diversion ditches and miscellaneous berms. The locations of these structures can be viewed on Drawing 5-3. The detailed analysis for these structures and specific designs can be viewed on Drawings 5-25 through 5-34. In addition, a geotechnical analysis of the impoundments to ensure stability can be viewed in Appendix 5-1. The watershed and structure sizing analysis can be viewed in Appendix 5-2. In addition to these primary structures, temporary diversions and impoundments may also be implemented, as necessary, in mining areas to further enhance pollution controls.

Sediment control measures will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-760. Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-763. Storm water and snow melt that occurs within the facilities area will be routed to an impoundment that will contain sediment. This impoundment will have a drop-pipe spillway installed that will allow removal of any oil sheens that may result from parking lots or maintenance activities by using absorbent materials to remove the sheen. Details for this impoundment can be viewed on Drawings 5-28.

There are four sediment impoundments proposed for the permit area. These structures will be constructed using a combination of dozers and backhoes. The structures have been designed to contain the required storm events as specified in Appendix 5-2. The structures will have sediment removed as necessary to ensure the required capacities. Details for these structures can be viewed on Drawings 5-25, 5-26 and 5-28 through 5-32. Calculations and supporting text can be viewed in Appendix 5-2.

Four diversion ditches along with four sediment impoundments are proposed for the permit area. In addition, miscellaneous controls such as silt fence and berms are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2.

The smallest practicable area, consistent with reasonable and safe mine operational practices will be disturbed at any one time during the mining operation and reclamation phases. This will be accomplished through progressive backfilling, grading, and prompt revegetation of disturbed areas.

There are no other coal processing waste banks, dams or embankments proposed within the permit area.

Diesel fuels, oils, greases, and other hydrocarbons products will be stored and used at the mine site for a variety of purposes. A spill Prevention Control and Countermeasure Plan will be implemented that will help minimize any potential detrimental impacts to the environments.

Products including potentially hazardous chemicals, fuels, and oils used in the mining process will be stored and used in a manner that minimizes the potential for these products to contaminate surface-water resources. Concrete oil and fuel containments will be constructed as shown on Drawings 5-3 and 5-8.

The wash bay at the mine site will include a closed circuit water recycle system. This system will eliminate and store water impurities and reroute water back through the wash bay for cleaning equipment, thus minimizing water consumption the potential for contamination of surface-water resources. Details for this structure can be viewed on Drawings 5-3, 5-8, and Appendix 5-4. .

Roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed according to R645-301-732.400, R645-301-742.400 and R645-301-762. The specific plan for road locations and design are presented in R645-301-534. The location and details for roads can be viewed on Drawings 5-3 and 5-22 through 5-24.

Roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed to control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area; Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under R645-301-751; minimize the diminution to or degradation of the quality or quantity of surface- and ground-water systems; and refrain from significantly altering the normal flow of water in streambeds or drainage channels. No acid- or toxic-forming substances will be used in road surfacing.

All roads will be removed and reclaimed according to Drawings 5-35 and 5-36. The estimated timetable for removing these roads is shown on Drawing 5-38. Cut ditches will be established on the shoulders of all primary roads to control drainage and erosion. Cut and fill slopes along the primary roads will be minimal and are not expected to cause significant erosion. In locations where there are culvert crossings (i.e. Lower Robinson Creek), the fills slopes will be stabilized by utilizing standard methods such as grass matting or straw wattles.

All wells will be managed to comply with R645-301-748 and R645-301-765. Water monitoring wells will be managed on a temporary basis according to R645-301-738.

Wells constructed for monitoring groundwater conditions in the proposed Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an

annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Water wells less than thirty feet deep are not regulated by the Utah Division of Water Rights. The permanent closure and abandonment of water wells less than 30 feet deep will be accomplished by filling the well casing with neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other appropriate materials. The well casing will then be cut off below the ground surface and native materials placed over the abandoned well site.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731 and be managed according to the following.

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

If mining and reclamation activities result in the contamination, diminution, or interruption of State appropriated groundwater or surface-water sources, replacement water will be provided using the alternate water source described in R645-301-727.

731.200 Water Monitoring

This section describes the hydrologic monitoring plan. Locations of surface-water and groundwater monitoring sites are indicated on Drawing 7-10. Hydrologic monitoring protocols, sampling frequencies, and sampling sites are described in Table 7-4. Groundwater and surface-water monitoring locations are listed in Table 7-5. Operational field and laboratory hydrologic monitoring parameters for surface water are listed in Table 7-6, and for groundwater in Table 7-7. The hydrologic monitoring parameters have been selected in consultation with the Division's directive Tech-006, *Water Monitoring Programs for Coal Mines.*

The groundwater and surface-water monitoring plan is extensive and includes 54 monitoring sites. The monitoring plan is designed to monitor groundwater and surface-water resources for any potential impacts that could potentially occur as a result of

mining and reclamation activities in the proposed Coal Hollow Mine permit and adjacent area. Each of the sampling locations and their monitoring purpose are described below.

Streams

Kanab Creek will be monitored at sites SW-3 (above the permit area), and SW-2 (below the permit area). Lower Robinson Creek will be monitored at sites SW-4 (above the permit area), SW-101 (within the permit area), and SW-5 (below the permit area above the confluence with Kanab Creek). The irrigation water near SW-4 will also be monitored at site RID-1. Swapp Hollow creek will be monitored above the permit area at site SW-8. Sink Valley Wash will be monitored at SW-6 (a small tributary to the wash immediately below the permit area) and at SW-9, located in the main drainage below the permit area. All of these locations, with the exception of RID-1) will be monitored for discharge and water quality parameters specified in Table 7-6 quarterly, when reasonably accessible. Additionally, Lower Robinson Creek will be monitored at site BLM-1, which is near the location of alluvial groundwater emergence in the bottom of the stream channel. BLM-1 and RID-1 will be monitored for discharge and field water quality parameters.

Springs

Eight springs from alluvial groundwater area A will be monitored including SP-8, SP-14, SP-16, SP-19, SP-20, SP-22, SP-24 and Sorensen Spring. Spring SP-8 is a developed spring in area A that provides culinary water for the Swapp Ranch house. SP-8 will be monitored for discharge and operational laboratory water quality measurements quarterly when reasonably accessible. Springs SP-14, SP-16, SP-19, SP-20, SP-22, SP-24 and Sorensen Spring springs will be monitored for discharge and field water quality measurements quarterly when reasonably accessible.

Springs SP-4 and SP-6, and SP-33, which are located in Sink Valley below the proposed mining area, will also be monitored. SP-6 is an area of diffuse seepage above an earthen impoundment in the wash immediately below the permit area. Spring SP-33 is a developed spring that discharges into a pond below the permit area and provides culinary water to two adjacent cabins. Each of these Springs SP-6 and SP-33 will be monitored for discharge and operational laboratory water quality measurements quarterly when reasonably accessible. SP-4 discharges from a fault/fracture system in the Dakota Formation near the canyon margin in Sink Valley Wash below the permit area. Spring SP-4 will be monitored for discharge and field water quality measurements quarterly when reasonably accessible. Spring SP-3 discharges from pediment alluvium in the upland area above Sink Valley Wash more than a mile from the permit area. It is extremely unlikely that discharge rates or water quality at this spring could be impacted

as a result of mining-related activities in the mine permit area. However, this spring will be monitored for discharge and field water quality measurements quarterly, primarily to provide background data from springs in the region.

Wells

Wells Y-98 (Robinson Creek alluvium above the permit area), Y-45 (coal seam well in Swapp Hollow above permit area), Y-102 (flowing alluvial well in alluvial groundwater discharge area A), Y-36 (coal seam well in Sink Valley above the permit area), Y-38 (coal seam well in Sink Valley permit area), Y-61 (alluvial well at the Sorenson Ranch), and C5-130 (new monitoring well in alluvial groundwater discharge A) will be monitored quarterly when reasonable accessible. Well Y-61 will be monitored for groundwater operational laboratory water quality parameters to monitor groundwater quality in alluvial groundwater discharge area A. The other wells will be monitored for water level only.

Additionally, 19 newly constructed monitoring wells constructed in the Sink Valley alluvial groundwater system will be monitored quarterly. These include C2-15, C2-28, C2-40, C3-15, C3-30, C3-40, C4-15, C4-30, C4-50, C7-20, C9-15, C9-25, C9-40, LS-28, LS-60, LS-85, SS-15, SS-30, and SS-75. All of these wells will be monitored quarterly for water level. Additionally, wells LS-85 and SS-30 will be monitored for groundwater operational laboratory water quality measurements.

Additionally two wells in the Lower Robinson Creek alluvium will be monitored for water level and groundwater operational laboratory chemistry. These include UR-70 located above proposed mining locations in the Lower Robinson Creek drainage, and LR-45, located below proposed mining areas adjacent to Lower Robinson Creek. It should be noted that LR-45 is located near a proposed sediment pond impoundment. Consequently, if this well becomes unsuitable for monitoring, an alternate location will be used to monitor the Lower Robinson alluvial groundwater system in this area.

Wells C0-18 and C0-54 are located near the initial proposed mining areas in the Lower Robinson Creek drainage. These will be monitored for water level quarterly.

It should be noted that many of the wells specified for monitoring in this monitoring plan will at some point be destroyed or rendered inoperable as the mine workings precede through the area. These wells will be monitored until such a time as they are destroyed or become inoperable.

Groundwater and surface-water monitoring will continue through the post-mining periods until bond release. The monitoring requirements, including monitoring sites, analytical parameters and the sampling frequency may be modified in the future in consultation with the Division if the data demonstrate that such a modification is warranted.

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731.600 Stream Buffer Zones

Any perennial or intermittent streams in the mine area will be protected by 100 foot stream buffer zones on either side of these streams. Coal mining and reclamation operations will not cause or contribute to the violation of applicable Utah or federal water standards and will not adversely affect the water quality and quantity or other environmental resources of the stream.

Temporary or permanent stream channel diversion will comply with R645-301-742-300. It should be noted that the proposed Coal Hollow Mine plan calls for the permanent diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the proposed diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of the meager discharge of surface water in the drainage below the planned diversion, where required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

The areas surrounding the streams that are not to be disturbed will be designated as buffer zones, and will be marked as specified in R645-301-521.260.

731.700 Cross sections and Maps

The locations of springs and seeps identified in the proposed Coal Hollow Mine permit and adjacent area are shown in Drawing 7-1. The locations of baseline hydrologic monitoring locations are shown on Drawing 7-2. The locations of water rights in the proposed Coal Hollow permit and adjacent area are provided on Drawing 7-3. Cross-sections depicting the stratigraphy and hydrostratigraphy of the proposed Coal Hollow Mine permit and adjacent area are presented in Chapter 6, Drawing 6-2. Designs for proposed impoundments in the proposed Coal Hollow permit area are shown in Drawings 5-25 through 5-31

731.800 Water Rights and Replacement

Alton Coal Development, LLC commits to replace the water supply of an owner of interest in real property who obtains all or part of his or her supply of water for domestic, agricultural, industrial, or other legitimate use from the underground or surface source, where the water supply has been adversely impacted by contamination, diminution, or interruption proximately resulting from the surface mining activities. Baseline hydrologic information required in R645-301-624.100 through R645-301-624.200, R645-301-625, R645-301-626, R645-301-723 through R645-301-724.300, R645-301-724.500, R645-301-725 through R645-301-731, and R645-301-731.210 through R645-301-

731.223 will be used to determine the extent of the impact of mining upon ground water and surface water.

732 Sediment Control Measures

Sediment control measures have been designed, constructed and maintained to prevent additional contributions of sediment to streamflow or to runoff outside the permit area.

732.100 Siltation Structures

Siltation structures within the permit area are described in Section 732.200

732.200 Sedimentation Ponds

Four diversion ditches along with four sediment impoundments are proposed for the permit area. In addition, miscellaneous controls such as silt fence and berms are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2.

Sedimentation ponds have been designed in compliance with the requirements of R645-301-356.300, R645-301-356.400, R645-301-513.200, R645-301-742.200 through R645-301-742.240, and R645-301-763.

No sedimentation ponds or earthen structures that will remain open are planned.

The sedimentation plan has been designed to comply with the MSHA requirements given under R645-301-513.100 and R645-301-513.200.

732.300 Diversions

The runoff control plan is designed to isolate, to the maximum degree possible, runoff from disturbed areas from that of undisturbed areas. Where possible, this has been accomplished by allowing up-stream runoff to bypass the disturbed area, and routing any runoff from undisturbed areas that enter the disturbed area into a sediment control system.

Four diversion ditches along with four sediment impoundments are proposed for the permit area. In addition, miscellaneous controls such as silt fence and berms are also proposed for specific areas. The proposed locations for these structures are shown on

Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2.

732.400 Road Drainage

All roads will be constructed, maintained and reconstructed to comply with R645-301-742.400. Road drainage facilities include diversion ditches, culverts, containment berms, and/or water bars. Specific plans for road drainage, road construction, and road maintenance are presented in Chapter 5, Section 534 of this MRP.

A description of measures to be taken to obtain division approval for alteration or relocation of a natural drainage way will be presented to the Division when necessary.

A description of measures to be taken to protect the inlet end of a ditch relief culvert will be submitted to the Division when necessary.

All road drainage diversions will be maintained and repaired to operational condition following the occurrence of a large storm event. Culvert inlets and outlets will be kept clear of sediment and other debris.

733 IMPOUNDMENTS

733.100 General Plans

A professional engineer experienced in the design and construction of impoundments with assistance from a geotechnical expert has used current, prudent, engineering practices to design the proposed impoundments.

The plans have been certified and a detailed geotechnical analysis has been provided in Appendix 5-1. The certifications, drawings and cross sections can be viewed in Drawings 5-25 through 5-31 and Appendices 5-1 and 5-2.

Five impoundments are proposed to control storm water runoff and sediment from disturbed areas. Each impoundment is designed to contain the run off from a 100 year, 24 hour duration storm event. The locations of the impoundments and the associated watersheds can be viewed on Drawing 5-26. The following table summarizes the final capacity results for each impoundment:

Sedimentation Impoundment Capacities				
Structure	Storage Required (ac/ft)	Design Storage* (ac/ft)	Percent of requirement	Additional Storage (ac/ft)
1	2.6	3.1	119	0.5
2	1.7	2.3	135	0.6
3	6.3	7.7	122	1.4
4	5.7	7.5	132	1.8
1B	0.5	0.8	160	0.3

Structure 1 is a rectangular impoundment approximately 136 feet long by 81 feet wide and 9 feet in depth. This impoundment will control storm water run off from the facilities area. The impoundment will be constructed with a 24" drop pipe spillway in order to prevent any oil sheens that may occur from discharging. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 3 feet freeboard. This pond will control storm water from a watershed of approximately 27 acres. The cleanout and spillway elevation are 6909' and 6918', respectively. The top of the embankment is at elevation 6922'. Details for the design can be viewed on Drawing 5-28.

Structure 1B is a small rectangular impoundment that is approximately 40 feet long by 20 feet wide. This impoundment will control storm water run off from the facilities access road system. The impoundment will be constructed with a 24" drop pipe spillway in order to prevent any oil sheens that may occur from discharging. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 5 acres. The cleanout and spillway elevation are 6892' and 6904', respectively. The top of the embankment is at elevation 6906'. Details for the design can be viewed on Drawing 5-28B.

Structure 2 is a rectangular impoundment approximately 188 feet long by 36 feet wide and 9 feet in depth. This impoundment will control storm water runoff from the disturbed areas immediately south of Lower Robinson Creek. The impoundment will be constructed with a 24" drop pipe spillway. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum 3 feet freeboard. This pond will control storm water runoff from a watershed of approximately 74 acres. The cleanout and spillway elevation are 6889' and 6898', respectively. Top of the embankment is at elevation 6901'. Details for the design can be viewed on Drawing 5-29.

Structure 3 is a valley fill impoundment that will impound an area approximately 484 feet long by 229 feet wide and 9 feet deep. The fill for the impoundment will be constructed from an excavation 198 feet wide by 229 feet long and 8 feet deep. The embankment will be constructed in 2 foot lifts utilizing a dozer. The top of the embankment will be a minimum 12 feet wide. The spillway will be an open channel that will have vegetated slopes. This pond will control storm water runoff from a watershed of approximately 300 acres. The cleanout and spillway elevation are 6802' and 6810', respectively. Top of the embankment is at 6814'. Details for the design can be viewed on Drawing 5-30.

Structure 4 is a rectangular pond located at the south end of the permit area that is approximately 92 feet wide by 628 feet long and 11 feet deep. This impoundment will be incised into the existing ground. Part of the excavation will be used to construct a 12 foot wide embankment. The spillway will be an open channel that will have vegetated slopes. This pond will control storm water runoff from a watershed of approximately 256 acres. The cleanout and spillway elevation are 6823' and 6834', respectively. Top of the embankment is at elevation 6838'. Details for the design can be viewed on Drawing 5-31.

Open channel spillway details for impoundments 3 and 4 are provided in Drawing 5-32. These spillways are designed for emergencies and are not expected to be used during normal operations.

The outer slopes of the impoundments will be sloped to a maximum grade of 3h:1v. Inside slopes will be graded to a maximum 2h:1v. The slopes will be graded and revegetated for erosion control.

No underground mine workings exist near or under the impoundment structures; therefore subsidence surveys are not provided.

Geologic data for the area where impoundments will be located consists of mainly fine grained alluvium with high clay content. Seepage from the impoundments is expected to be minimal based on the high clay content of the existing materials. Characterization of the soils is contained in Chapter 2. Acid and Toxic analysis of the soils indicates that water seeping through the alluvium layer will not result in reducing water quality. The acid and toxic analysis for the alluvium can be viewed in Appendix 6-2.

Hydrologic data for the permit area is provided in Appendix 7-1. This data indicates that there will be some seepage through the subsurface that may travel to adjacent drainages. The quantities for this seepage are expected to be minimal and will have minimal impact to the overall hydrologic balance. Even though seepage may occur, analysis of the soils indicates that water quality will not be diminished.

The above information provides a summary of all the impoundment structures that are proposed for the Coal Hollow Project. Detailed designs and calculations are provided in this section, Drawings 5-26 through 5-32 and Appendix 5-2. No other impoundments are anticipated.

733.200 Permanent and Temporary Impoundments

All impoundments have been designed and constructed using current, prudent engineering practices and have been designed to comply with the requirements of R645-301-512.240, R645-301-514.300, R645-301-515.200, R645-301-533.100 through R645-301-533.600, R645-301-733.220 through R645-301-733.226, R645-301-743.240, and R645-301-743.

No impoundments or sedimentation ponds meeting the size or other qualifying criteria of MSHA, 30 CFR 77.216(a) exist or are planned within the proposed Mine Permit Area. Should impoundments and sedimentation ponds meeting the size or other qualifying criteria of MSHA, 30 CFR 77.216(a) become necessary, compliance with the requirements of MSHA, 30 CFR 77.216 will be met.

All five planned impoundments have been evaluated by a professional engineer to ensure stability of each structure. The stability analysis performed resulted in a static safety factor of at least 2.2 for each structure. The details for this analysis can be viewed in Appendix 5-1.

No permanent impoundments are planned in the project area.

If any examination or inspection discloses that a potential hazard exists, the person who examined the impoundment will promptly inform the Division according R645-301-515.200.

734 Discharge Structures

Discharge structures will be constructed and maintained to comply with R645-301-744.

The proposed impoundments are designed to temporarily store water from storm events and snow melt. Long term standing water in the impoundments is anticipated to be seasonal and sediment will be removed as necessary to provide the required storage capacities. Emergency spillways have been included in the designs to provide a non-destructive discharge route should the capacities ever be exceeded. Surveys of these impoundments will be regularly conducted to ensure that the required design capacities are available.

Impoundments 3 and 4 will be constructed with open channel spillways. These spillways are designed to discharge a 6 hour duration, 100 year storm event even though they are not expected to be used. They will be vegetated to minimize erosion and spillway slopes will not exceed 3h:1v. Drawing 5-32 provides the details for the open channel spillways.

Impoundments 1, 1B and 2 will be constructed with a drop pipe spillway system. Storm water and snow melt that occurs within the associated watersheds will be routed to these impoundments to contain sediment. These impoundments will have the drop-pipe

spillways installed which will allow removal of any oil sheens that may result from parking lots, primary roads or maintenance activities by using absorbent materials to remove the sheen. The drop-pipe spillways are 24" diameter pipes that are vertical in the impoundment. These pipes have a metal cover over the end. This cover is recessed over the pipe by at least an inch, with a gap between the cover and the pipe. This leaves a route for water to discharge once the impoundment is full but prevents debris or pollutants located on the water surface from discharging. This system was chosen for these three impoundments based on their locations in relation to the facilities and primary roads. This discharge system will be constructed for precautionary measures only since pollutants are not expected in the impoundments during normal operations.

735 Disposal of Excess Spoil

Areas designated for the disposal of excess spoil and excess spoil structures will be constructed and maintained to comply with R645-301-745.

Details of proposed excess spoil disposal plans are presented in Chapter 5, Section 535 of this MRP and are summarized below.

A geotechnical analysis has been completed for the proposed excess spoil structure. This analysis estimates the long-term safety factor to be 1.6 to 1.7 based on the proposed design. Following proper construction practices of building the structure in maximum four foot lifts and meeting 85% compaction based on the standard Procter will ensure that the structure will be stable under all conditions of construction. This construction will occur only in the designated excess spoil area as shown on Drawing 5-3 and 5-35. The fill will be placed with end dump haul trucks and lifts will be constructed using dozers. High precision GPS systems will be regularly utilized to check grades and appropriate lift thickness. The geotechnical analysis for this structure can be viewed in Appendix 5-1.

The excess spoil is planned to be placed in an area where natural grades range from 0 to 5%. This is one of the most moderately sloping locations in the Permit Area. Stability of this structure is estimated to be 1.6 to 1.7 based on the Appendix 5-1.

Geotechnical borings were completed in the foundation of the proposed disposal area. Laboratory analysis of these borings has also been completed. Details of this analysis can be viewed in Appendix 5-1.

Permanent slopes for the proposed excess spoil will not exceed 3h:1v (33 percent), therefore no keyway cuts have been proposed in the design. Appendix 5-1 details the stability analysis for the proposed structure.

Excess spoil will not be disposed of in underground mine workings.

Horizontal lifts will not exceed four feet in thickness unless otherwise approved by the Division. The lifts will be concurrently compacted to meet 85% of the standard Procter. The geotechnical analysis (Appendix 5-1), provides information showing that these construction standards will provide mass stability and will prevent mass movement during and after construction. The excess spoil will be graded to provide drainage similar to original flow patterns. Topsoil and subsoil as designated in Chapter 2 will be removed and separated from other materials prior to placement of spoil.

A description of the character of the bedrock and any adverse geologic conditions in presented in Appendix 5-1.

Spring and seep survey information is provided on Drawing 7-1. There are no springs or seeps identified in the excess spoil area.

There are no historical underground mining operations in the proposed excess spoil area. There are also no future underground operations proposed.

There are no rock chimneys or drainage blankets proposed.

A stability analysis including strength parameters, pore pressures and long-term seepage conditions is presented together with all supporting data in Appendix 5-1.

Neither rock-toe buttresses nor key-way cuts are required under R645-301-535.112 or R645-301-535.113.

No valley fills or head-of-hollow fills are proposed.

No durable rock fills are proposed.

No disposal of waste on preexisting benches is planned

The excess spoil structure and fill above approximate original contour are the only alternative specifications proposed. A geotechnical analysis has been completed for this proposal and can be viewed in Appendix 5-1. All other mined areas will be restored to approximate original contour.

736 Coal Mine Waste

Areas designated for disposal of coal mine waste and coal mine waste structures will be constructed and maintained to comply with R645-301-746.

No structures for the disposal of coal mine waste are planned.

737 Noncoal Mine Waste

Noncoal mine waste will be stored and final disposal of noncoal mine waste will comply with R645-301-747

Noncoal mine waste, including but not limited to grease, lubricants, paints, flammable liquids, garbage, machinery, lumber and other combustible materials generated during coal mining and reclamation operations will be temporarily stored in a controlled manner. Final disposal of noncoal mine wastes will consist of removal from the project area and transportation to a State-approved solid waste disposal area.

Only sizing of the coal is proposed. This process will not produce any waste.

At no time will any noncoal mine waste be deposited in a refuse pile or impounding structure, nor will any excavation for a noncoal mine waste disposal site be located within eight feet of any coal outcrop or coal storage area.

Notwithstanding any other provision to the R645 Rules, any noncoal mine waste defined as "hazardous" under 3001 of the Resource Conservation and Recovery Act (RCRA) (Pub. L. 94-580, as amended) and 40 CFR Part 261 will be handled in accordance with the requirements of Subtitle C of RCRA and any implementing regulations.

Debris, acid-forming, toxic-forming materials and materials constituting a fire hazard will be identified and disposed of in accordance with R645-301-528.330, R645-301-537.200, R645-301-542.740, R645-301-553.100 through R645-301-553.600, R645-301-553.900, and R645-301-747. Appropriate measures will be implemented to preclude sustained combustion of such materials.

Plans do not include using dams, embankments or other impoundments for disposal of coal, overburden, excess spoil or coal mine waste.

738 Temporary Casing and Sealing of Wells

Wells constructed for monitoring groundwater conditions in the proposed Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other

material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

740 DESIGN CRITERIA AND PLANS

741 GENERAL REQUIREMENTS

742 SEDIMENT CONTROL MEASURES

742.100 General Requirements

742.110 Design

Appropriate sediment control measures will be designed, constructed and maintained using best technology currently available to prevent to the extent possible, contributions of sediment to stream flow or to runoff outside the permit area; meet the effluent limitations under R645-301-751; and minimize erosion to the extent possible.

Four diversion ditches along with five sediment impoundments are proposed for the permit area. In addition, miscellaneous controls such as silt fence and berms are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2. These impoundments in combination with the ditches will be the primary method that will be used to control sediment resulting from disturbed areas. In addition to the drawings and Appendix 5-2 , the following is a description of the structures:

A professional engineer experienced in the design and construction of impoundments with assistance from a geotechnical expert has used current, prudent, engineering practices to design the proposed impoundments.

The plans have been certified and a detailed geotechnical analysis has been provided in Appendix 5-1. The certifications, drawings and cross sections can be viewed in Drawings 5-25 through 5-31 and Appendices 5-1 and 5-2.

Five impoundments are proposed to control storm water runoff and sediment from disturbed areas. Each impoundment is designed to contain the run off from a 100 year, 24 hour duration storm event. The locations of the impoundments and the associated watersheds can be viewed on Drawing 5-26. The following table summarizes the final capacity results for each impoundment:

Sedimentation Impoundment Capacities				
Structure	Storage Required (ac/ft)	Design Storage* (ac/ft)	Percent of requirement	Additional Storage (ac/ft)
1	2.6	3.1	119	0.5
2	1.7	2.3	135	0.6
3	6.3	7.7	122	1.4
4	5.7	7.5	132	1.8
1B	0.5	0.8	160	0.3

Structure 1 is a rectangular impoundment approximately 136 feet long by 81 feet wide and 9 feet in depth. This impoundment will control storm water run off from the facilities area. The impoundment will be constructed with a 24" drop pipe spillway in order to prevent any oil sheens that may occur from discharging. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 4 feet freeboard. This pond will control storm water from a watershed of approximately 27 acres. The cleanout and spillway elevation are 6909' and 6918', respectively. The top of the embankment is at elevation 6922'. Details for the design can be viewed on Drawing 5-28.

Structure 1B is a small rectangular impoundment that is approximately 40 feet long by 20 feet wide. This impoundment will control storm water run off from the facilities access road system. The impoundment will be constructed with a 24" drop pipe spillway in order to prevent any oil sheens that may occur from discharging. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 5 acres. The cleanout and spillway elevation are 6892' and 6904', respectively. The top of the embankment is at elevation 6906'. Details for the design can be viewed on Drawing 5-28B.

Structure 2 is a rectangular impoundment approximately 188 feet long by 36 feet wide and 9 feet in depth. This impoundment will control storm water runoff from the disturbed areas immediately south of Lower Robinson Creek. The impoundment will be constructed with a 24" drop pipe spillway. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum 3 feet freeboard. This pond will control storm water runoff from a watershed of approximately 74 acres. The cleanout and spillway elevation are 6889' and 6898', respectively. Top of the embankment is at elevation 6901'. Details for the design can be viewed on Drawing 5-29.

Structure 3 is a valley fill impoundment that will impound an area approximately 484 feet long by 229 feet wide and 9 feet deep. The fill for the impoundment will be constructed from an excavation 198 feet wide by 229 feet long and 8 feet deep. The embankment will be constructed in 2 foot lifts utilizing a dozer. The top of the embankment will be a minimum 12 feet wide. The spillway will be an open channel that will have vegetated

slopes. This pond will control storm water runoff from a watershed of approximately 300 acres. The cleanout and spillway elevation are 6802' and 6810', respectively. Top of the embankment is at 6814'. Details for the design can be viewed on Drawing 5-30.

Structure 4 is a rectangular pond located at the south end of the permit area that is approximately 92 feet wide by 628 feet long and 11 feet deep. This impoundment will be incised into the existing ground. Part of the excavation will be used to construct a 12 foot wide embankment. The spillway will be an open channel that will have vegetated slopes. This pond will control storm water runoff from a watershed of approximately 256 acres. The cleanout and spillway elevation are 6823' and 6834', respectively. Top of the embankment is at elevation 6838'. Details for the design can be viewed on Drawing 5-31.

Open channel spillway details for impoundments 3 and 4 are provided in Drawing 5-32. These spillways are designed for emergencies and are not expected to be used during normal operations.

The outer slopes of the impoundments will be sloped to a maximum grade of 3h:1v. Inside slopes will be graded to a maximum 2h:1v. The slopes will be graded and revegetated for erosion control.

No underground mine workings exist near or under the impoundment structures; therefore subsidence surveys are not provided.

Geologic data for the area where impoundments will be located consists of mainly fine grained alluvium with high clay content. Seepage from the impoundments is expected to be minimal based on the high clay content of the existing materials. Characterization of the soils is contained in Chapter 2. Acid and Toxic analysis of the soils indicates that water seeping through the alluvium layer will not result in reducing water quality. The acid and toxic analysis for the alluvium can be viewed in Appendix 6-2.

Hydrologic data for the permit area is provided in Appendix 7-1. This data indicates that there will be some seepage through the subsurface that may travel to adjacent drainages. The quantities for this seepage are expected to be minimal and will have minimal impact to the overall hydrologic balance. Even though seepage may occur, analysis of the soils indicates that water quality will not be diminished.

Sedimentation ponds have been designed in compliance with the requirements of R645-301-356.300, R645-301-356.400, R645-301-513.200, R645-301-742.200 through R645-301-742.240, and R645-301-763.

No sedimentation ponds or earthen structures that will remain open are planned.

The sedimentation plan has been designed to comply with the MSHA requirements given under R645-301-513.100 and R645-301-513.200.

The diversions ditches will be utilized to direct runoff from disturbed areas to the sediment impoundments. The channel sizing for the four proposed diversion ditches has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 100 year, 24 hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. Similar to the impoundment sizing, the Carlson Software Hydrology module was utilized to perform these calculations. The ditch locations, designs and cross sections can be viewed on Drawings 5-33 and 5-34.

The following table summarizes the inputs and results for each diversion based on flows during a 100 year, 24 hour storm event:

Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	3.0	0.020	2.8	14.8	0.5	6.8	0.3
2	2.5	0.020	3.5	6.9	0.4	6.0	0.3
3	4.5	0.020	2.4	16.7	0.5	6.3	0.3
4	5.0	0.020	1.8	19.8	0.6	5.4	0.3

*All side slopes are 2h:1v

The sedimentation plan has been designed to comply with the MSHA requirements given under R645-301-513.100 and R645-301-513.200.

These structures will retain sediment within the disturbed area. The diversion ditches are designed in manner that will minimize erosion of the channels and will divert runoff from disturbed areas to the impoundments. These sediment control measures are designed to meet the effluent limitations under R645-301-751.

742.200 Siltation Structures

Siltation structures have been designed in compliance with the requirements of R645-301-742.

Miscellaneous controls such as silt fence and berms are proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-26. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2.

742.210 General Requirements

Additional contributions of suspended solids and sediment to streamflow or runoff outside the permit area will be prevented to the extent possible using the best technology currently available. Siltation structures for an area will be constructed before beginning any coal mining and reclamation operations in that area and, upon construction, will be

certified by a qualified registered professional engineer to be constructed as designed and as approved in the reclamation plan. Any siltation structures which impounds water will be designed, constructed and maintained in accordance with R645-301-512.240, R645-301-514.300, R645-301-515.200, R645-301-533.100 through R645-301-533.600, R645-301-733.220 through R645-301-733.224, and R645-301-743.

The primary controls for limiting suspended solids and sediment to stream flow and runoff outside the permit area is sediment impoundments and diversions ditches. The proposed system described in section 742.110 is designed to control storm water/runoff discharges from the disturbed areas. Discharges from this system are expected to be minimal and infrequent. Discharges that may occur will comply with R645-301-751.

The impoundment and ditch system will be inspected regularly and discharges will be sampled for water quality purposes.

742.220 Sedimentation Ponds.

742.221.1 The proposed sediment ponds are designed to be used individually

742.221.2 The locations for the sediment ponds were selected to be as near as possible to the disturbed areas and are not located in perennial streams

742.221.3 The ponds are designed and will be constructed and maintained to:

742.221.31 The ponds have been designed with excess capacity by at least 15% to allow for adequate sediment storage volume. The following table provides the design capacities in relation to a 24 hour duration, 100 year storm event:

Sedimentation Impoundment Capacities

Structure	Storage Required (ac/ft)	Design Storage* (ac/ft)	Percent of requirement	Additional Storage (ac/ft)
1	2.6	3.1	119	0.5
2	1.7	2.3	135	0.6
3	6.3	7.7	122	1.4
4	5.7	7.5	132	1.8
1B	0.5	0.8	160	0.3

These sedimentation ponds will be surveyed at least annually to ensure that sufficient sediment storage is available in the impoundment. Sediment will be removed from the ponds as required based on results from the surveys. Calculations related to these design capacities can be viewed in Appendix 5-2. Stage-Storage curves for each pond can be viewed on Drawings 5-28 through 5-31.

742.221.32 The sedimentation ponds are designed to provide detention for a 100 year, 24 hour duration storm event. Calculations for this design can be viewed in Appendix 5-2. This design standard is expected to keep discharges from the structure at a minimum and allow adequate settlement time to meet Utah and federal effluent limitations.

742.221.33 The sedimentation ponds are designed for a 100 year, 24 hour storm event which significantly exceeds a 10 year, 24 hour precipitation event. The 100 year, 24 hour event in the Alton area is 3.1 inches of precipitation. The 10 year, 24 hour precipitation event in this same location is approximately 2.0 inches of precipitation. The design standard used for the Coal Hollow project is 155% of the precipitation for the required "design event".

742.221.34 Each pond will be constructed with an emergency spillway, should the capacities of the ponds ever be exceeded. These spillways will provide a nondestructive route for storm water discharge, though the capacities of the ponds are not expected to be exceeded. The design capacities of the ponds are expected to contain each storm event and therefore will provide sufficient detention time to meet Utah and federal effluent limitations. The following is a description of each spillway:

Impoundments 3 and 4 will be constructed with open channel spillways. These spillways are designed to discharge a 24 hour duration, 100 year storm event even though they are not expected to be used during normal operations. They will be vegetated to minimize erosion and spillway slopes will not exceed 3h:1v. Drawing 5-32 provides the details for the open channel spillways.

Impoundments 1, 1B and 2 will be constructed with a drop pipe spillway system. Storm water and snow melt that occurs within the associated watersheds will be routed to these impoundments to contain sediment. These impoundments will have the drop-pipe spillways installed which will allow removal of any oil sheens that may result from parking lots, primary roads or maintenance activities by using absorbent materials to remove the sheen. The drop-pipe spillways are 24" diameter pipes that are vertical in the impoundment. These pipes have a metal cover over the end. This cover is recessed over the pipe by at least an inch, with a gap between the cover and the pipe. This leaves a route for water to discharge once the impoundment is full but prevents debris or pollutants located on the water surface from discharging. This system was chosen for these two impoundments based on their locations in relation to the facilities and primary roads. This discharge system will be constructed for precautionary measures only since pollutants are not expected in the impoundments during normal operations.

742.221.35 Regular inspections of the sediment pond system during construction and operations will identify any deficiencies that could cause short circuiting. Design standards for the system will ensure proper functioning during extreme storm events which makes it highly unlikely that issues related to short circuiting could occur during normal operations.

742.221.36 Surveys of the pond system will be conducted at least annually. These surveys will be compared against the required "design event" capacity for each pond. Sediment removal will occur as needed to maintain the required capacity.

742.221.37 Geologic conditions in the areas where sediment ponds will be constructed are suitable to the proposed use. Excessive settling of the ponds is not expected based on the high clay content of the soils. Embankments will be constructed in maximum two foot lifts to promote compaction during the construction process, reducing settling during operations. Supporting data for compaction can be viewed in Appendix 5-1.

742.221.38 Any sod, large roots, and/or frozen soil will be removed from sedimentation ponds. No coal processing will be conducted as part of the Coal Hollow Project; therefore wastes from this type of process will not be present.

742.221.39 Embankments will be constructed in maximum two foot lifts to promote compaction during the construction process, reducing settling during operations. Supporting data for this compaction method can be viewed in Appendix 5-1.

742.222 Sedimentation ponds for the Coal Hollow Project do not meet the size or other qualifying standard for MSHA, 30 CFR 77.216(a).

742.223 Each sedimentation pond will be constructed with a spillway that will function as both the emergency and principle spillway. Each of these spillways will safely discharge a 25 year, 6 hour precipitation event. The following table summarizes the spillway discharge designs in relation to the 25 year, 6 hour precipitation event:

Sediment Impoundment – Spillway Flow Capacities		
Impoundment	Required Spillway Discharge (cfs)	Designed Spillway Discharge (cfs)
1	30.4	37.4
2	0.8	30.5
3	2.8	11.5
4	2.4	11.5
1B	6.06	23.9

The drop pipe spillways for impoundments 1, 1B and 2 will be of nonerodible construction. The open channel spillways for impoundments 3 and 4 will be grass lined and are designed to carry short-term, infrequent flows at non erosive velocities where sustained flows are not expected.

742.224 Either the requirements of 742.223.1 or 742.223.2 will be met for each sediment impoundment.

742.225 No exceptions to the sediment pond location guidance are requested

742.230 Other Treatment Facilities

If other treatment facilities become necessary, they will be designed to treat the 10-year, 24-hour precipitation event unless a lesser design event is approved by the Division based on terrain, climate, other site-specific conditions and a demonstration by the operator that the effluent limitations of R645-301-751 will be met.

No other treatment facilities are planned for the Coal Hollow Project.

742.240 Exemptions

Not Applicable

742.300 Diversions

742.310 General Requirements

742.311 There are no flows from mined areas that have been abandoned prior to May 3, 1978 at the Coal Hollow Project. Diversions at the Coal Hollow Project are planned to minimize water from disturbed areas from directly discharging into drainages without first being treated and to also prevent water from upland, adjacent areas from entering the project area. Four temporary diversion ditches are planned and one temporary diversion of Lower Robinson Creek. Two diversions will be primarily used to route water from upland, undisturbed areas away from the planned disturbed areas. Two diversions are planned to direct water from disturbed areas into sediment impoundments. The temporary diversion of Lower Robinson Creek is for maximum recovery of coal and will route flows around the mining area. Each temporary diversion has been designed to only carry runoff from areas that will or potentially could be affected by the mining operations, except Lower Robinson Creek diversion which will carry intermittent flows from the upstream watershed. Diversion locations were selected to generally carry runoff to the drainage paths

that the precipitation would originally follow. These parameters were followed in the designs to minimize impacts to the overall hydrological balance within the permit and adjacent areas. Diversions will not be used to route water into underground mines. Specific design parameters are discussed in the following sections (R645-301-742.312.1 to 742.314).

742.312 Each diversion was designed to ensure stability and to minimize erosion. In order to accomplish this standard, the diversions were each designed for peak flows during a 100 year, 24 hour storm event. The following summarizes the steps used:

The channel sizing for the four proposed temporary diversion ditches has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 100 year, 24 hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. Similar to the impoundment sizing, the Carlson Software Hydrology module was utilized to perform these calculations. The ditch locations, designs and cross sections can be viewed on Drawings 5-33 and 5-34.

The following table summarizes the inputs and results for each diversion based on flows during a 100 year, 24 hour storm event:

Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	3.0	0.020	2.8	14.8	0.5	6.8	0.3
2	2.5	0.020	3.5	6.9	0.4	6.0	0.3
3	4.5	0.020	2.4	16.7	0.5	6.3	0.3
4	5.0	0.020	1.8	19.8	0.6	5.4	0.3

*All side slopes are 2h:1v

As shown in the above table, flow depths will be shallow, flow velocity will be manageable for temporary flow conditions and sufficient freeboard will be present during a flood event. These conditions will provide diversion stability, protection against flooding and prevent to the extent possible additional contributions of suspended solids to streamflow outside the permit area. These diversions are designed to comply with all applicable local, Utah and federal laws and regulations. Further details related to the temporary diversion designs can be viewed in Appendix 5-2.

Based on the size of the watershed for Lower Robinson Creek, a different method of analysis was used than the method used for the other diversions. The HEC-1 program was used for this analysis and extra erosion protection has been included as part of the design. The channel was designed to safely handle the flows from a 100 year, 6 hour storm event. This diversion will be further discussed in section 742.320 Diversion of Perennial and Intermittent Streams.

742.313 The four temporary diversions will be reclaimed when they are no longer necessary. This will occur once final reclamation is determined to be sufficient within the project area and the sediment impoundments are no longer needed. This is anticipated to occur in the fourth year of operations.

The Lower Robinson Creek temporary diversion will be constructed in a responsible manner. This diversion will experience some erosion during flood events but erosion rates are expected to be generally less than those in the original channel above and below the diversion. The detailed design for this diversion can be viewed in Drawings 5-20 and 21. Calculations related to this diversion design can be viewed in Appendix 5-3.

742.320 Diversion of Perennial and Intermittent Streams.

742.321 Temporary diversion of one intermittent stream is planned for the Coal Hollow Project. The planned diversion is in a length of the stream that appreciable flows only occur during storm events and snow melt periods. This diversion is necessary to recover coal located in the northwest corner of the project area. The diversion would provide mining in an area that is 22 acres and contains approximately 400,000 tons of recoverable coal. Without this diversion, most of this area could not be mined.

742.322 The original unmodified channel immediately upstream and downstream from the Lower Robinson Creek diversion has excessive erosion and is not in stable condition. The channel has incised deeply and has developed into a channel that has a capacity significantly greater than any anticipated storm events. Since these conditions are not desirable for the area, the diversion design instead has dimensions that are suitable to pass a 100 year, 6 hour storm event in compliance with R645-301-742.323.

742.323 The temporary Lower Robinson Creek diversion has been designed to safely pass a 100 year, 6 hour storm event. The watershed for this drainage is 3.64 square miles and has a peak flow of 83.5 cubic feet per second during a 100 year, 6 hour event. Minimum dimensions for carrying this flow was found to be a channel that has the following dimensions:

Bottom width: 2 feet
Side slopes: 3h:1v
Minimum slope height: 3 feet (1 foot freeboard added)

Details related to the design calculations are provided in Appendix 5-3. Rip-rap will be appropriately placed to minimize erosion of the channel.

Cross sections of the channel design are shown in Drawing 5-21. As shown in the drawing, all sections of the diversions exceed the minimum design standard. A plan view of the diversion design can be viewed in Drawing 5-20.

742.324 Design of the Lower Robinson Creek Diversion has been certified by a qualified registered professional engineer.

742.330 Diversion of Miscellaneous Flows.

742.323

As part of the reclamation process, Lower Robinson Creek will be reconstructed to its approximate original location. The design for this reconstruction is shown on Drawings 5-20A and 5-21A. This design includes considerable improvements to the channel compared to the channel's current condition. The current condition is such that less than 25% of the channel within the disturbed area has a flood plain present and most of the slopes are near the angle of repose with fair to poor vegetative cover. The reconstructed sides of the channel for the entire length reconstructed. Sharp corners in the original alignment have been rounded to sinuous curve shapes and rip-rap will be installed in the bottom section of the channel to minimize erosion. The flood plain will be seeded and covered with erosion matting to control erosion until natural vegetative condition can be attained.

742.331 Diversion of miscellaneous flows is planned using four diversion ditches. Two diversions will be primarily used to route runoff from upland, undisturbed areas away from the planned disturbed areas. Two diversions are planned to direct runoff from disturbed areas into sediment impoundments. The locations of these diversions along with the associated watersheds can be viewed on Drawings 5-27, 5-33 and 5-34. Calculations related to the diversions can be viewed in Appendix 5-2.

742.332 Each diversion was designed for stability and to minimize erosion. In order to accomplish this standard, the diversions were each designed for peak flows during a 100 year, 24 hour storm event. The following summarizes the steps used:

The channel sizing for the four proposed temporary diversion ditches has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 100 year, 24 hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. Similar to the impoundment sizing, the Carlson Software Hydrology module was utilized to perform these calculations. The ditch locations, designs and cross sections can be viewed on Drawings 5-33 and 5-34.

The following table summarizes the inputs and results for each diversion based on peak flows during a 100 year, 24 hour storm event:

Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	3.0	0.020	2.8	14.8	0.5	6.8	0.3
2	2.5	0.020	3.5	6.9	0.4	6.0	0.3
3	4.5	0.020	2.4	16.7	0.5	6.3	0.3
4	5.0	0.020	1.8	19.8	0.6	5.4	0.3

*All side slopes are 2h:1v

As shown in the above table, flow depths will be shallow, flow velocity will be manageable for temporary flow conditions and sufficient freeboard will be present during a flood event. These conditions will provide diversion stability, protection against flooding and prevent to the extent possible additional contributions of suspended solids to stream flow outside the permit area. These diversions are designed to comply with all applicable local, Utah and federal laws and regulations. Further details related to the temporary diversion designs can be viewed in Appendix 5-2.

742.333 All four miscellaneous flow diversions planned for the project are temporary and will be reclaimed when no longer necessary for sediment and storm water control. Therefore, the channels must safely pass the peak runoff from a 2 year, 6 hour event. As previously described, these diversions have been designed to pass a 100 year, 24 hour storm event which significantly exceeds this required design standard. Precipitation from a 100 year, 24 hour storm event for this area is 3.1 inches while precipitation for the 2 year, 6 hour event is less than 1 inch.

742.400 Road Drainage

742.410 All Roads

742.411 To ensure environmental protection and safety appropriate for the planned duration and use, limits have been incorporated in the road designs for the Coal Hollow Project. These limits are applied to drainage control and culvert placement/sizing. These limits take into consideration the type and size of equipment planned for the operation. The following is a description of roads along with the design limits and standards that will be incorporated into construction:

Two primary Mine Haul roads are planned within the permit area. The first road extends from the coal unloading area to the first series of pits along the west side of the property. This road will be utilized for access to pits 1 through 15 (pits shown on Drawing 5-10). This road will be approximately 2,600 feet in length and will be utilized mainly during the first two years of mining. There will be three culverts installed along this road all sized for a 100 year, 6 hour storm event. The first culvert will be across a tributary of Lower Robinson Creek and will be a 36 inch corrugated steel pipe. The second culvert is the main crossing over Lower Robinson Creek and is a 96 inch corrugated steel pipe. Both of these culverts have been sized based on analysis of the Lower Robinson Creek watershed. This analysis can be viewed in Appendix 5-3. The third culvert is a crossing over a diversion ditch that will route water mainly from disturbed areas along the south side of Lower Robinson Creek to a sediment impoundment. This culvert will be a 24 inch corrugated steel pipe.

The second road extends from an intersection with the first road, located just south of the Lower Robinson Creek crossing, and proceeds south to approximately pit 25. This road is approximately 2,500 feet in length and will be used for the south pits 16 through 30. There is one culvert crossing along this road to cross a diversion ditch. This culvert will be a 24 inch culvert.

The following specifications apply to these two Primary Mine Haul roads:

1) Roads will be approximately 80' in width
2) Approximately a 2% crown
3) Approximately one foot deep cut ditches along shoulders for controlling storm water
4) 18" of crushed rock or gravel for road surfacing
5) Cut and fill slopes of 1.5h:1v

6) Minimum fill over each culvert will be 2 times diameter of culvert
7) Berms placed as necessary along fills

The ancillary roads will have similar specifications except surfacing will occur only as needed and may be narrowed to a 40 foot road width.

The location and details for all these roads can be viewed on Drawings 5-3 and 5-22 through 5-24.

In addition to the two primary Mine Haul roads, the road located within the facilities area is also classified as a primary road. This road is planned to be 24 feet wide with 24 inches of compacted sub base and 8 inches of compacted 1 inch minus gravel as surfacing. This road system will have four culverts and selectively located berms to appropriately route water to the two sediment impoundments for the facilities area. The location of these culverts and berms is shown on Drawing 5-3. This road is referred to as "Facilities Roadway" and more details are described in 527.200 along with Drawings 5-22A and 5-22B.

The ramps, benches and equipment travel paths within the active surface mining area are temporary in nature and will be relocated frequently as mining progresses. These temporary travelways are considered part of the pit due to their short term use, and are not individually designed nor engineered. They will be built and maintained to facilitate safe and efficient mine and reclamation operations.

All roads will be maintained on an as needed basis using motor graders, water trucks for dust suppression, and other equipment as necessary. Crushed stone and/or gravel will be used as a surface course for primary roads outside the active mining area, and may be used as needed for ramps and travelways within the pit. Should the roads be damaged by a catastrophic event, such as an earthquake or a flood, repairs will be made as soon as possible after the damage has occurred or the road will be closed and reclaimed.

Cut and fill slopes along the primary roads will be minimal and are not expected to cause significant erosion. The water from roads in the project area will not directly discharge to drainages outside the project area without first being treated by flowing through a sediment impoundment. In locations where there are culvert crossings (i.e. Lower Robinson Creek), the fills slopes will be stabilized by utilizing standard methods such as grass matting or straw wattles.

742.412 No roads will be located in the channel of an intermittent or perennial stream.

742.413 Primary roads constructed utilized during mining operations have been designed and located to route runoff from the roads to the sediment impoundment system. By routing the runoff to this system, sedimentation and flooding downstream resulting from the roads will be minimized. All other roads located within the active mining area will also follow this standard and runoff from the roads will not be directly discharged to drainages outside the permit area.

742.420 Primary Roads

742.421 To minimize erosion, primary roads will be constructed with a rock surface with minimal cut and fill slopes. These roads are located in the most practicable, stable areas within the permit boundary and mostly outside of the designed pits. These locations can be reviewed on Drawing 5-22 through 5-22G. Further descriptions of these roads can be viewed in Section 742.423.1 and 742.111.

742.422 There are no stream fords by primary roads at the Coal Hollow Project.

742.423 Drainage Control

- 742.423.1 Two primary Mine Haul roads are planned within the permit area. The first road extends from the coal unloading area to the first series of pits along the west side of the property. This road will be utilized for access to pits 1 through 15 (pits shown on Drawing 5-10). This road will be approximately 2,600 feet in length and will be utilized mainly during the first two years of mining. There will be three culverts installed along this road all sized for a 100 year, 24 hour storm event. The first culvert will be across a tributary of Lower Robinson Creek and will be a 36 inch corrugated steel pipe. The second culvert is the main crossing over Lower Robinson Creek and is a 96 inch corrugated steel pipe. Both of these culverts have been sized based on analysis of the Lower Robinson Creek watershed. This analysis can be viewed in Appendix A5-3. The third culvert is crossing over a diversion ditch that will route water mainly from disturbed areas along the south side of Lower Robinson Creek to a sediment impoundment. This culvert will be a 24 inch corrugated steel pipe.

  The second road extends from an intersection with the first road, located just south of the Lower Robinson Creek crossing, and proceeds south to approximately pit 25. This road is approximately 2,500 feet in length and will be used for the south pits 16 through 30. There is one culvert crossing along this road to cross a diversion ditch. This culvert will be a 24 inch culvert sized for maximum anticipated flows in the diversion.

The following specifications apply to these Primary mine haul roads:

1) Roads will be approximately 80' in width
2) Approximately a 2% crown
3) Approximately one foot deep cut ditches along shoulders for controlling storm water
4) 18" of crushed rock or gravel for road surfacing
5) Cut and fill slopes of 1.5 h:1v
6) Minimum fill over each culvert will be 2 times diameter of culvert
7) Berms placed as necessary along fills

The location and details for Primary Mine Haul roads can be viewed on Drawings 5-3 and 5-22 and 5-23.

In addition to the two roads primary Mine Haul roads, the road located within the facilities area is also classified as a primary road. This road is planned to be 24 feet wide with 24 inches of compacted sub base and 8 inches of compacted 1 inch minus gravel as surfacing. This road system will have four culverts and selectively located berms appropriately placed to route water to the two sediment impoundments for the facilities area. The location of these culverts and berms is shown on Drawing 5-3. This road is referred to as "Facilities Roadway" and more details are described in 527.200 along with Drawings 5-22A and 5-22B.

In addition to the primary roads that will be present during active mining, four additional roads are planned to exist postmining and are also classified as primary roads for this reason.

Roads that will remain postmining are the following:

- Road to Water Well with details shown on Drawing 5-22D
- Road to east C. Burton Pugh property with details shown on Drawing 5-22C
- County Road 136 (K3900) with details on Drawing 5-22E, 5-22F and 5-22G. This County road will be reconstructed within the permit area by Kane County. This reconstruction will occur concurrently with the final stage of reclamation as scheduled on Drawing 5-38 and is expected to be completed by the end of Year 4.
- Road to Swapp Ranch (same specification as the Water Well Road)

The location of these roads is shown on Drawings 5-35 and 5-37 along with the post mining topography. With the exception of the County Road, each road will be graded to complement the surrounding topography and drainages. Details for these roads are provided in the above referenced drawings.

County Road 136 will have a cut ditch on the up gradient side of the road as appropriate. The culvert located at the crossing of Lower Robinson Creek will remain. One culvert will be added at Station 21+66 as shown on Drawing 5-22E.

For further details related to reestablishment of County Road 136, refer Drawings 5-22 through 5-22G and 5-35.

742.423.2 Drainage pipes and culverts will be constructed on a minimum 2% grade to avoid plugging. Minimum fill over culverts will be 2 times the diameter of the culvert itself to avoid collapsing. Grades going in and out of each culvert will be similar to the grade of the culvert itself to avoid erosion at the inlet and outlet.

742.423.3 Drainage ditches have been designed to pass a 100 year 24 hour storm event which will prevent uncontrolled drainage over the road surface and embankment. The watersheds associated with drainage in the project area are each relatively small (less than 400 acres) and are not expected to sustain flows that would carry significant debris through the project area. Therefore, trash racks and debris basins are not expected to be necessary at the Coal Hollow Project.

742.423.4 One natural intermittent stream channel is planned to be diverted. This channel is referred to as Lower Robinson Creek and this diversion will be temporary. A section of this stream runs across an area that is planned for mining.

The Lower Robinson Creek diversion has been designed to safely pass a 100 year, 6 hour storm event. The watershed for this drainage is 3.64 square miles and has a peak flow of 83.5 cubic feet per second during a 100 year, 6 hour event. Minimum dimensions for carrying this flow were found to be a channel that has the following dimensions:

Bottom width: 2 feet
Side slopes: 3h:1v
Minimum slope height: 3 feet (1 foot freeboard added)

Details related for the design calculations are provided in Appendix 5-3. Rip-rap will be appropriately placed to minimize erosion of the channel.

Cross sections of the channel design are shown in Drawing 5-21. As shown in the drawing, all sections of the diversions exceed the minimum design standard. A plan view of the diversion design can be viewed in Drawing 5-20. This diversion design is in accordance with R645-301-731.100 through R645-301-731.522, R645-301.600, R645-301-731.800, R645-301-742.300, and R645-301-751.

Design of the Lower Robinson Creek Diversion has been certified by a qualified registered professional engineer.

742.423.5 All stream crossings are planned to be culverts designed to pass the 100 year, 6 hour storm event. There are no plans to use fords as stream crossings.

743 IMPOUNDMENTS

743.100 General Requirements

Five temporary impoundments are planned at the Coal Hollow Project. Design for these structures are shown in Drawings 5-28 through 5-32. These impoundments do not meet the criteria for Class B or C dams as specified in the U.S. Department of Agriculture, Natural Resources Conservation Service Technical Release 60.

743.110 None of the impoundments meet the criteria of MSHA, 30 CFR 77.216(a).

743.120 A professional engineer experienced in the design and construction of impoundments with assistance from a geotechnical expert has used current, prudent, engineering practices to design the proposed impoundments.

The plans have been certified and a detailed geotechnical analysis has been provided in Appendix 5-1. The certifications, drawings and cross sections can be viewed in Drawings 5-25 through 5-31 and Appendices 5-1 and 5-2.

Each impoundment is designed with a minimum freeboard of 2 feet. Based on the size of the impoundments and the relatively small size of the associated watersheds, this amount of freeboard will be sufficient to prevent overtopping from waves and/or storm events. These impoundments do no meet the criteria for Class B or C dams.

743.130

Each impoundment will be constructed with a spillway that will function as both the emergency and principle spillway. Each of these spillways will safely discharge a 25 year, 6 hour precipitation event. The following table summarizes the spillway discharge designs in relation to the 25 year, 6 hour precipitation event:

Sediment Impoundment – Spillway Flow Capacities		
Impoundment	Required Spillway Discharge (cfs)	Designed Spillway Discharge (cfs)
1	30.4	37.4
2	0.8	30.5
3	2.8	11.5
4	2.4	11.5
1B	6.06	23.9

The drop pipe spillways for impoundments 1, 1B and 2 will be of nonerodible construction. The open channel spillways for impoundments 3 and 4 will be grass lined

and are designed to carry short-term, infrequent flows at non erosive velocities where sustained flows are not expected.

The impoundments at the Coal Hollow project do not meet the criteria for either Class B or C dams or MSHA CFR 77.216 (a).

743.140

A professional engineer or specialist experienced in the construction of impoundments will inspect impoundments. Inspections will be made regularly during construction, upon completion of construction, and at least yearly until removal of the structure or release of the performance bond. The qualified registered professional engineer will promptly, after each inspection, provide to the Division, a certified report that the impoundment has been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules. The report will include discussion of any appearances of instability, structural weakness or other hazardous conditions, depth and elevation of any impounded waters, existing storage capacity, any existing or required monitoring procedures and instrumentation and any other aspects of the structure affecting stability. A copy of the report will be retained at or near the mine site.

The MRP does not contemplate construction of any impoundments meeting the NRCS Class B or C criteria for dams in TR-60, or the size or other criteria of 30 CFR Sec. 77.216.

743.200

No permanent impoundments are planned.

743.300

Design capacities for spillways exceed the 25 year, 6 hour event. The design capacities are provided in the table located in section R645-301-743.130.

744 DISCHARGE STRUCTURES

744.100

Each pond will be constructed with an emergency spillway, should the capacities of the ponds ever be exceeded. These spillways will provide a nondestructive route for storm water discharge, though the capacities of the ponds are not expected to be exceeded. The design capacities of the ponds are expected to contain each storm event and therefore will provide sufficient detention time to meet Utah and federal effluent limitations. The following is a description of each spillway:

Impoundments 3 and 4 will be constructed with open channel spillways. These spillways are designed to discharge a 24 hour duration, 100 year storm event even though they are not expected to be used during normal operations. They will be vegetated to minimize erosion and spillway slopes will not exceed 3h:1v. Drawing 5-32 provides the details for the open channel spillways.

Impoundments 1, 1B and 2 will be constructed with a drop pipe spillway system. Storm water and snow melt that occurs within the associated watersheds will be routed to these impoundments to contain sediment. These impoundments will have the drop-pipe spillways installed which will allow removal of any oil sheens that may result from parking lots, primary roads or maintenance activities by using absorbent materials to remove the sheen. The drop-pipe spillways are 24" diameter pipes that are vertical in the impoundment. These pipes have a metal cover over the end. This cover is recessed over the pipe by at least an inch, with a gap between the cover and the pipe. This leaves a route for water to discharge once the impoundment is full but prevents debris or pollutants located on the water surface from discharging. This system was chosen for these two impoundments based on their locations in relation to the facilities and primary roads. This discharge system will be constructed for precautionary measures only since pollutants are not expected in the impoundments during normal operations.

The drop pipe spillways for impoundments 1, 1B and 2 will be of nonerodible construction. The open channel spillways for impoundments 3 and 4 will be grass lined and are designed to carry short-term, infrequent flows at non erosive velocities where sustained flows are not expected. These designs will minimize erosion and disturbance to the hydrologic balance.

Details related to these designs can be viewed in Drawings 5-28 through 5-32.

744.200

Standard engineering design procedures have been used in the design of the discharge structures along with standard mining industry best management practices that are commonly used at surface mining operations.

745 Disposal of Excess Spoil

745.100 General Requirements

Excess spoil will be placed in designated disposal areas within the permit area, in a controlled manner to minimize the adverse effects of leachate and surface water runoff from the fill on surface and ground waters; ensure permanent impoundments are not located on the completed fill. Small depressions may be created if approved by the Division if they are needed to retain moisture or minimize erosion, create and enhance wildlife habitat or assist revegetation, and if they are not incompatible with the stability of the fill; and adequately cover or treat excess spoil that is acid- and toxic-forming with nonacid nontoxic material to control the impact on surface and ground water is

accordance with R645-301-731.300 and to minimize adverse effects on plant growth and the approved postmining land use.

If the disposal area contains springs, natural or manmade water courses or wet weather seeps, the fill design will include diversions and underdrains as necessary to control erosion, prevent water infiltration into the fill and ensure stability.

Details of proposed excess spoil disposal plans are presented in Chapter 5, Section 535 of this MRP and are summarized below.

A geotechnical analysis has been completed for the proposed excess spoil structure. This analysis estimates the long-term safety factor to be 1.6 to 1.7 based on the proposed design. Following proper construction practices of building the structure in maximum four foot lifts and meeting 85% compaction based on the standard Procter will ensure that the structure will be stable under all conditions of construction. This construction will occur only in the designated excess spoil area as shown on Drawing 5-3 and 5-35. The fill will be placed with end dump haul trucks and lifts will be constructed using dozers. High precision GPS systems will be regularly utilized to check grades and appropriate lift thickness. The geotechnical analysis for this structure can be viewed in Appendix 5-1.

The excess spoil is planned to be placed in an area where natural grades range from 0 to 5%. This is one of the most moderately sloping locations in the Permit Area. Stability of this structure is estimated to be 1.6 to 1.7 based on the Appendix 5-1.

Geotechnical borings were completed in the foundation of the proposed disposal area. Laboratory analysis of these borings has also been completed. Details of this analysis can be viewed in Appendix 5-1.

Permanent slopes for the proposed excess spoil will not exceed 3h:1v (33 percent), therefore no keyway cuts have been proposed in the design. Appendix 5-1 details the stability analysis for the proposed structure.

Excess spoil will not be disposed of in underground mine workings.

Horizontal lifts will not exceed four feet in thickness unless otherwise approved by the Division. The lifts will be concurrently compacted to meet 85% of the standard Procter. The geotechnical analysis (Appendix 5-1), provides information showing that these construction standards will provide mass stability and will prevent mass movement during and after construction. The excess spoil will be graded to provide drainage similar to original flow patterns. Topsoil and subsoil as designated in Chapter 2 will be removed and separated from other materials prior to placement of spoil.

A description of the character of the bedrock and any adverse geologic conditions in presented in Appendix 5-1.

Spring and seep survey information is provided on Drawing 7-1. There are no springs or seeps identified in the excess spoil area.

There are no historical underground mining operations in the proposed excess spoil area. There are also no future underground operations proposed.

There are no rock chimneys or drainage blankets proposed.

A stability analysis including strength parameters, pore pressures and long-term seepage conditions is presented together with all supporting data in Appendix 5-1.

Neither rock-toe buttresses nor key-way cuts are required under R645-301-535.112 or R645-301-535.113.

No valley fills or head-of-hollow fills are proposed.

No durable rock fills are proposed.

No disposal of waste on preexisting benches is planned

The excess spoil structure and fill above approximate original contour are the only alternative specifications proposed. A geotechnical analysis has been completed for this proposal and can be viewed in Appendix 5-1. All other mined areas will be restored to approximate original contour.

745.200 Valley Fills and Head-of-Hollow Fills

Valley fills and head-of-hollow fills are not anticipated in the Coal Hollow Mine permit area.

745.300. Durable Rock Fills.

Durable rock fills are not anticipated in the proposed Coal Hollow Mine permit area.

745.400. Preexisting Benches.

The disposal of excess spoil through placement on preexisting benches is not anticipated in the proposed Coal Hollow Mine permit area.

746. COAL MINE WASTE

746.100. General Requirements.

No coal mine waste is anticipated.

746.200. Refuse Piles.

No refuse piles associated with coal mine waste are anticipated.

746.300. Impounding structures.

No impounding structures associated with coal mine waste are anticipated.

746.330. Drainage control.

No coal mine waste and associated drainage control is anticipated.

746.400. Return of Coal Processing Waste to Abandoned Underground Workings.

No coal mine waste is anticipated, nor are any underground workings planned.

747. DISPOSAL OF NONCOAL WASTE

747.100

Noncoal mine waste, including but not limited to grease, lubricants, paints, flammable liquids, garbage, machinery, lumber and other non combustible materials generated during coal mining and reclamation operations will be temporarily placed in covered dumpsters. This waste will be regularly removed from the project area and disposed of at a state approved solid waste disposal site outside the project area.

747.200

Noncoal mine waste will be stored in a metal, covered dumpster which will prevent storm precipitation or runoff from coming in contact with the waste.

747.300

No noncoal mine waste will be disposed of within the permit area.

748. Casing and Sealing of Wells.

Wells constructed for monitoring groundwater conditions in the proposed Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water

wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of

abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

750 PERFORMANCE STANDARDS

All coal mining and reclamation operations will be conducted to minimize disturbance to the hydrologic balance within the permit and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area and support approved postmining land uses in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302. Mining operations will be conducted to assure the protection or replacement of water rights in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.

751. Water Quality Standards and Effluent Limitations.

Discharges of water from areas disturbed by coal mining and reclamation operations will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U.S. Environmental Protection Agency set forth in 40 CFR Part 434.

Discharges from the Coal Hollow project are expected to be minimal based on the storm water and runoff controls that are described in R645-301-740. These structures are designed to contain large storm events without discharging runoff. Any runoff that does discharge will be treated through the sediment pond system.

752. Sediment Control Measures

Sediment control measures will be located, maintained, constructed and reclaimed according to the plans and designs given under sections R645-301-732, R645-301-742 and R645-301-760. Plans and designs are described in these sections.

752.100
Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-763. Plans and designs are described in these sections.

752.200. Road Drainage

Roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed according to R645-301-732.400, R645-301-742.400 and R645-301-762 and to achieve the following:

Control or prevent erosion, siltation and the air pollution attendant to erosion by vegetating or otherwise stabilizing all exposed surfaces in accordance with current, prudent engineering practices;

Control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area;

Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under R645-301-751;

Minimize the diminution to or degradation of the quality or quantity of surface- and ground-water systems; and

Refrain from significantly altering the normal flow of water in streambeds or drainage channels.

All plans and designs to meet these standards are described in the above referenced sections and on Drawings 5-22 through 5-24.

753. Impoundments and Discharge Structures

Impoundments and discharge structures will be located, maintained, constructed and reclaimed to comply with R645-301-733, R645-301-734, R645-301-743, R645-301-745 and R645-301-760. Plans and designs are described in these sections.

754. Disposal of Excess Spoil, Coal Mine Waste and Noncoal MineWaste.

Disposal areas for excess spoil, coal mine waste and noncoal mine waste will be located, maintained, constructed and reclaimed to comply with R645-301-735, R645-301-736, R645-301-745, R645-301-746, R645-301-747 and R645-301-760. Plans and designs are described in these sections.

755. Casing and Sealing of Wells

All wells will be managed to comply with R645-301-748 and R645-301-765. Water monitoring wells will be managed on a temporary basis according to R645-301-738.

Wells constructed for monitoring groundwater conditions in the proposed Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.

Water wells less than thirty feet deep are not regulated by the Utah Division of Water Rights. The permanent closure and abandonment of water wells less than 30 feet deep will be accomplished by filling the well casing with neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other appropriate materials. The well casing will then be cut off below the ground surface and native materials placed over the abandoned well site.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

760. RECLAMATION

761. GENERAL REQUIREMENTS

Before abandoning a permit area or seeking bond release, the mine will ensure that all temporary structures are removed and reclaimed, and that all permanent sedimentation ponds, diversions, impoundments and treatment facilities meet the requirements of R645-301 and R645-302 for permanent structures, have been maintained properly and meet the requirements of the approved reclamation plan for permanent structures and impoundments. The mine will renovate such structures if necessary to meet the requirements of R645-301 and R645-302 and to conform to the approved reclamation plan.

762. ROADS

A road not to be retained for use under an approved postmining land use will be reclaimed immediately after it is no longer needed for coal mining and reclamation operations, including restoring the natural drainage patterns, and reshaping all cut and fill slopes to be compatible with the postmining land use and to complement the drainage pattern of the surrounding terrain.

The post mining land configuration is shown on 5-35 along with postmining road locations. Cuts and fills for the reclaimed roads will be minimal which allows for minor construction to grade roads to the approximate landform that existed prior to disturbance.

763. SILTATION STRUCTURES

763.100.

Siltation structures will be maintained until removal is authorized by the Division and the disturbed area has been stabilized and revegetated. In no case will the structure be removed sooner than two years after the last augmented seeding.

All impoundments will be reclaimed at the end of operations. The estimated timeline for removal of these structures are shown on Drawing 5-38. Expected removal is year four of the mining and reclamation process. In areas where soils are not stabilized following the removal of these sediment impoundments, silt fence will be appropriately installed and maintained to provide sediment control until stable conditions are met.

763.200.

When the siltation structure is removed, the land on which the siltation structure was located will be regraded and revegetated in accordance with the reclamation plan and R645-301-358, R645-301-356, and R645-301-357.

No permanent sedimentation impoundments are planned.

764. STRUCTURE REMOVAL

The application will include the timetable and plans to remove each structure, if appropriate.

All impoundments will be reclaimed at the end of operations. The estimated timeline for removal of these structures are shown on Drawing 5-38. Expected removal is year four of the mining and reclamation process. In areas where soils are not stabilized following the removal of these sediment impoundments, silt fence will be appropriately installed and maintained to provide sediment control until stable conditions are met.

The facilities will be fully reclaimed at the end of mining operations with the exception of the water well shown on Drawing 5- 8B. The final contour for this area can be viewed on Drawing 5-35.

The reclamation sequence and final landform can be viewed on Drawings 5-35 and 5-38.

765. PERMANENT CASING AND SEALING OF WELLS

Wells constructed for monitoring groundwater conditions in the proposed Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.

Water wells less than thirty feet deep are not regulated by the Utah Division of Water Rights. The permanent closure and abandonment of water wells less than 30 feet deep will be accomplished by filling the well casing with neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other appropriate materials. The well casing will then be cut off below the ground surface and native materials placed over the abandoned well site.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper

approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

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Insertion instructions

Replace the existing tables 7-4, 7,5, 7-6, and 7-7 with these new tables.

Table 7-4 Hydrologic monitoring protocols and locations.

Discharge and water level measurements

Protocol	Applies to	Parameter	Frequency
A	Streams	Discharge	Quarterly
B	Springs	Discharge	Quarterly
C	Monitoring wells	Water elevation	Quarterly

Water quality

Protocol	Applies to	Parameters	Table	Frequency
1	Streams	Field and operational laboratory water quality measurements	7-6	Quarterly
2	Streams	Field water quality measurements only	7-6	Quarterly
3	Springs	Field and operational laboratory water quality measurements	7-7	Quarterly
4	Springs	Field water quality measurements only	7-7	Quarterly
5	Monitoring wells	Field and operational laboratory water quality measurements	7-7	Quarterly
6	Monitoring wells	Field water quality measurements only	7-7	Quarterly

Table 7-5 Hydrologic monitoring locations.

Site	Protocols	Comments
Streams		
BLM-1	A, 2	Lower Robinson Creek adjacent to mined areas
RID-1	A, 2	Irrigation ditch in Robinson Creek
SW-2	A, 1	Kanab Creek below Robinson Creek
SW-3	A, 1	Kanab Creek above permit area
SW-4	A, 1	Lower Robinson Creek above permit area
SW-5	A, 1	Lower Robinson Creek above Kanab Creek
SW-6	A, 1	Sink Valley Wash at permit boundary
SW-8	A, 1	Swapp Hollow Creek above permit area
SW-9	A, 1	Sink Valley Wash below permit area
SW-101	A, 2	Lower Robinson Creek in permit area
Springs		
Sorensen Spring	B,4	Developed alluvial spring in Sink Valley at Sorensen ranch
SP-3	B, 4	Spring in upland pediment alluvium south of permit area
SP-4	B, 3	Developed spring in Sink Valley Wash 1 mile below permit area
SP-6	B, 3	Seep in Sink Valley below permit area
SP-8	B, 3	Developed alluvial spring in Sink Valley at Dames ranch
SP-14	B, 3	Alluvial spring in Sink Valley
SP-16	B, 4	Alluvial spring in Sink Valley
SP-20	B, 3	Alluvial spring in Sink Valley
SP-22	B, 4	Alluvial spring in Sink Valley
SP-23	B, 4	Alluvial spring in Sink Valley
SP-33	B, 3	Developed spring in lower Sink Valley alluvium
Wells		
Y-36	C	Coal well in Sink Valley above permit area
Y-38	C	Coal well in Sink Valley in permit area
Y-45	C	Coal seam well in Swapp Hollow above permit area
Y-61	C, 5	Water well in Sink Valley artesian alluvial groundwater system above permit area
Y-63	C	Monitoring well in lower Sink Valley Alluvium below mining areas
Y-98	C	Alluvial well in Robinson Creek above permit area
Y-102	C	Alluvial well in upper Sink Valley in permit area
C0-18	C	Alluvial monitoring well in Lower Robinson Creek drainage
C0-54	C	Monitoring well in Lower Robinson Creek drainage near coal seam
C1-24	C	Alluvial monitoring well in Lower Robinson Creek drainage
C2-15	C	Monitoring well in Sink Valley alluvium

Site	Protocols	Comments
C2-28	C	Monitoring well in Sink Valley alluvium
C2-40	C	Monitoring well in Sink Valley alluvium
C3-15	C	Monitoring well in Sink Valley alluvium
C3-30	C	Monitoring well in Sink Valley alluvium
C3-40	C	Monitoring well in Sink Valley alluvium
C4-15	C	Monitoring well in Sink Valley alluvium
C4-30	C	Monitoring well in Sink Valley alluvium
C4-50	C	Monitoring well in Sink Valley alluvium
C5-130	C	Monitoring well in Sink Valley artesian alluvial groundwater system above permit area
C7-20	C	Monitoring well in Sink Valley alluvium
C9-15	C	Monitoring well in Sink Valley alluvium
C9-25	C	Monitoring well in Sink Valley alluvium
C9-40	C	Monitoring well in Sink Valley alluvium
LR-45	C, 5	Monitoring well in Lower Robinson Creek alluvium below mine area
LS-28	C, 5	Monitoring well in Sink Valley Alluvium below mining areas
LS-60	C	Monitoring well in Sink Valley Alluvium below mining areas
LS-85	C, 5	Monitoring well in artesian Sink Valley Alluvium below mining areas
SS-15	C	Monitoring well in Sink Valley Alluvium below mining areas
SS-30	C, 5	Monitoring well in Sink Valley Alluvium below mining areas
SS-75	C	Monitoring well in burned coal area material
UR-70	C, 5	Monitoring well in Lower Robinson Creek alluvium above mine area

Table 7-6 Surface water operational water quality monitoring

FIELD MEASUREMENTS	REPORTED AS
pH	pH units
Specific Conductivity	µs/cm @ 25°C
Dissolved Oxygen	mg/L
Temperature	°C
LABORATORY MEASUREMENTS	
Total Dissolved Solids	mg/L
Total Suspended Solids	mg/L:
Bicarbonate	mg/L
Carbonate	mg/L
Calcium (dissolved)	mg/L
Chloride	mg/L
Iron (total)	mg/L
Iron (dissolved)	mg/L
Magnesium (dissolved)	mg/L
Manganese (total)	mg/L
Manganese (dissolved)	mg/L
Potassium (dissolved)	mg/L
Sodium (dissolved)	mg/L
Sulfate	mg/L
Oil and grease	mg/L
Cations	meq/l
Anions	meq/l
Cation/Anion Balance	%

Table 7-7 Groundwater operational water quality monitoring.

FIELD MEASUREMENTS	REPORTED AS
pH	pH units
Specific Conductivity	µs/cm @ 25°C
Temperature	°C
LABORATORY MEASUREMENTS	
Total Dissolved Solids	mg/L
Carbonate	mg/L
Bicarbonate	mg/L
Calcium (dissolved)	mg/L
Chloride	mg/L
Iron (total)	mg/L
Iron (dissolved)	mg/L
Magnesium (dissolved)	mg/L
Manganese (total)	mg/L
Manganese (dissolved)	mg/L
Potassium (dissolved)	mg/L
Sodium (dissolved)	mg/L
Sulfate	mg/L
Cations	meq/L
Anions	meq/L
Cation/Anion Balance	%

Instructions:

Replace old Appendix 7-1 cover and signature pages with the new cover and signature pages.

Investigation of Groundwater and Surface-Water Systems in the 630-Acre Proposed Coal Hollow Mine permit And Adjacent Area; Probable Hydrologic Consequences of Coal Mining; Recommended Monitoring Plan; Potential Alluvial Valley Floor Information; Kane County, Utah

15 December 2008

Alton Coal Development, LLC
Cedar City, Utah

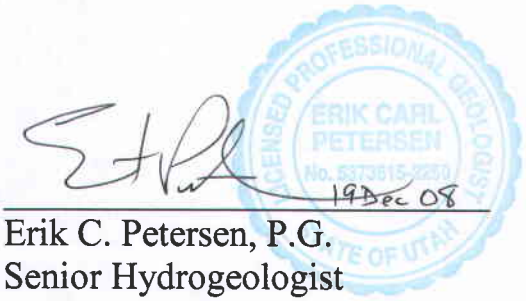
PETERSEN HYDROLOGIC, LLC
CONSULTANTS IN HYDROGEOLOGY

Investigation of Groundwater and Surface-Water Systems in the 630-Acre Proposed Coal Hollow Mine permit And Adjacent Area; Probable Hydrologic Consequences of Coal Mining; Recommended Monitoring Plan; Potential Alluvial Valley Floor Information; Kane County, Utah

15 December 2008

Alton Coal Development, LLC
Cedar City, Utah

Prepared by:



19 Dec 08

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Instructions:

Page 48 of Appendix 7-1 (Petersen Hydrologic, LLC groundwater and surface-water report) is being replaced with a new Page 48

- Crop production for each landowner adjacent to the proposed Coal Hollow Mine permit area

There are three owners of agricultural land located adjacent to the proposed Coal Hollow Mine permit area. The crop production for each of these landowners is presented below.

Mr. Richard Dame
There has not been any crop production on Mr. Dame's property in the recent past. Agricultural use of the land has been limited to the grazing of a few horses and/or cows on the property from the months of April through November. Irrigation of the land has not occurred in at least the past 10 years. The post-mining land use plan (See Coal Hollow Mine MRP; R645-301-400) suggests that 1.125 animals/month/acre could reasonably be sustained on the property.

Mr. Burton Pugh
There has not been any crop production on Mr. Pugh's property in the recent past. The land is comprised of unirrigated pasture land, meadows, sagebrush/grass, pinyon-juniper, and oak brush communities. The livestock currently sustained on Mr. Pugh's pasture land are mostly cattle, but sometimes horses are kept on the property. The animals are supported in the pastures from April through November of the year. The post-mining land use plan (See Coal Hollow Mine MRP; R645-301-400) suggests that 1.125 animals/month/acre could reasonably be sustained on the property.

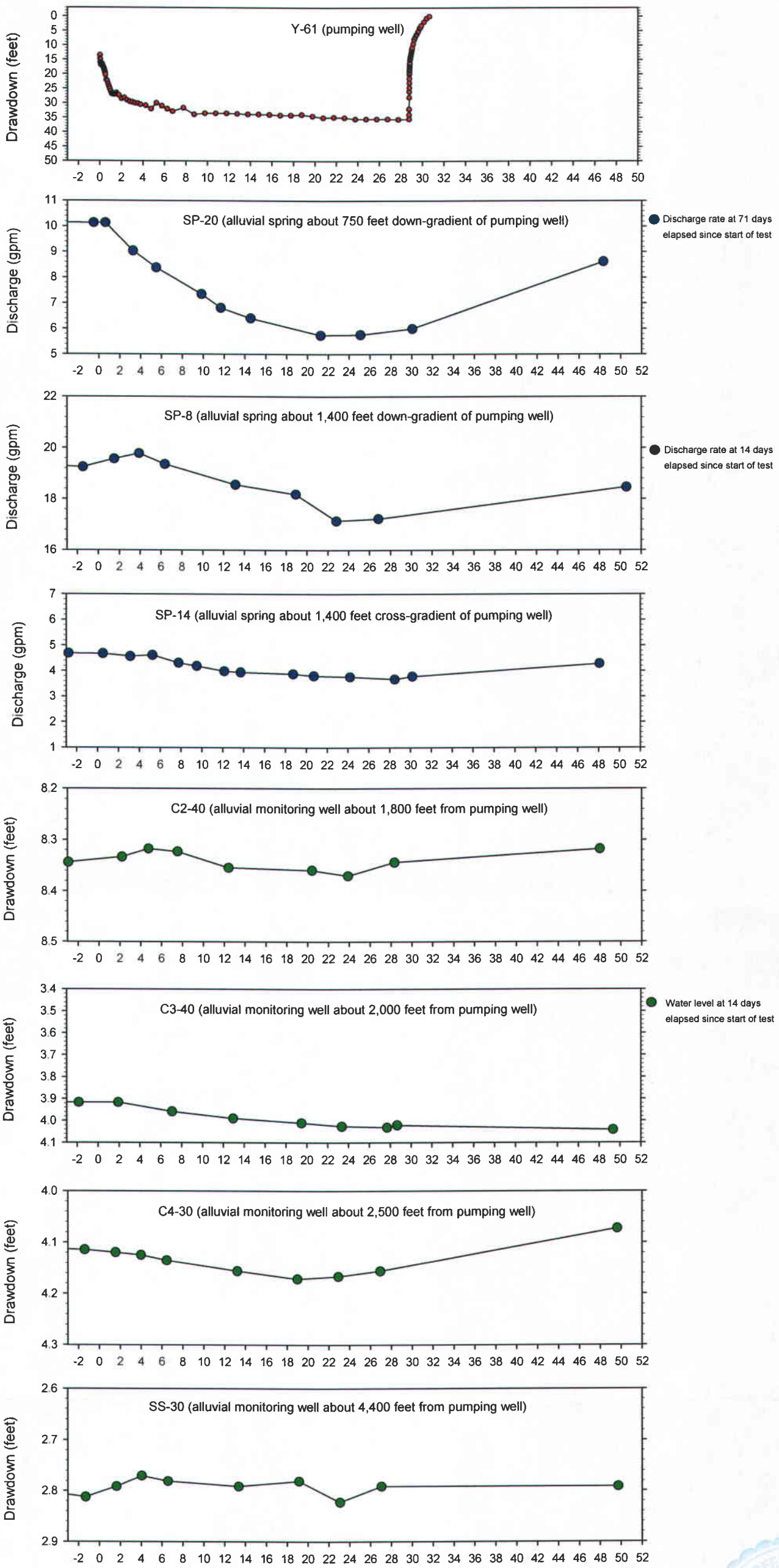
Mr. Darlynn Sorensen
Agricultural production on Mr. Sorensen's property includes 154 acres of grass hay that is not irrigated except in wet years with appreciable precipitation and stream runoff (Personal communication, Darlynn Sorensen, 2007) Typical production from the 154-acre field ranges from about 1,400 to 2,000 80-pound bales of grass hay per year. Rarely, during optimal climatic conditions, up to 6,000 80-pound bales of grass hay have been harvested from the 154-acre field. The production is highly dependent on the amount and timing of precipitation in the region, with increased production occurring during wet years. Approximately 200 cows and calves use the pasture for a short period of time during the year.

- Locations of irrigation diversion structures

The locations of irrigation diversions and ditches are shown in Chapter 7 of the Coal Hollow Mine (Drawing 7-7).

- Mapping of alluvium, stream laid deposits, and the direction of flow of groundwater (in particular near-surface ground water) on or adjacent to the proposed permit area.

Figure 18 of Appendix 7-1 (Petersen Hydrologic, LLC groundwater and surface-water report) is being replaced with a new Figure 18



Pumping well drawdowns plotted in red
Spring discharges in the alluvial groundwater system plotted in blue
Monitoring well drawdowns in the clayey, silty alluvial groundwater plotted in green

Figure 18 Plots of water level responses and spring discharge rates during the pump-test at Y-61.

Insertion Instructions:

This Petersen Hydrologic, LLC spring and seep survey report replaces the previous spring and seep survey report that is included as sub-Appendix B of Appendix 7-1

Spring and Seep Survey
Coal Hollow Project
Summary Report

11 December 2008

Alton Coal Development, LLC
Cedar City, Utah

Petersen Hydrologic, LLC
CONSULTANTS IN HYDROGEOLOGY

Spring and Seep Survey
Coal Hollow Project
Summary Report

11 December 2008

Alton Coal Development, LLC
Cedar City, Utah

Prepared by:

12/19/08

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Coal Hollow Project

Spring and Seep Survey

Summary Report

Introduction

Alton Coal Development, LLC is currently preparing a Mining and Reclamation Plan for the proposed Coal Hollow Mine, which is located in Kane County, Utah, approximately three miles south of the town of Alton, Utah (Figure 1). In 2005, Petersen Hydrologic, LLC was commissioned by Alton Coal Development, LLC to perform a spring and seep survey of the Coal Hollow Project and surrounding area. Commencing in the second quarter of 2005, a field investigation was performed with the purpose of identifying the locations of springs and seeps in the area. Seasonal discharge-rate measurements and field water quality measurements were also performed on the identified springs and seeps. The purpose of this document is to present the results of the Coal Hollow Project spring and seep survey.

Including this introduction, this report contains the following sections:

- Introduction
- Methods of Study
- Climate
- Presentation of Data
- Discussion and Conclusions
- References Cited

Methods of Study

The specific methods of study utilized to perform the Coal Hollow Project spring and seep survey are described below.

Determination of Extent of Survey Area

The extents of the primary spring and seep survey area for the Coal Hollow Project spring and seep survey are shown on Plate 1. The primary spring and seep survey region was selected to include all of the area within about ½ mile of the proposed mine permit area and to include all areas believed to have any reasonably plausible potential for mining-related impacts to groundwater resources. Areas adjacent to the major stream drainages more distant from the proposed mining area, including Sink Valley Wash and its tributaries, Lower Robinson Creek, and Kanab Creek, were also included in the primary spring and seep survey area as shown on Plate 1. Selected additional areas outside the primary spring and seep survey boundary, where the potential for the presence of springs or seeps was considered likely, were also inventoried as part of this investigation.

Previous Hydrogeologic Investigations and Spring and Seep Surveys

Maps and reports of previous hydrogeologic investigations and spring and seep surveys in the project area were obtained and reviewed. These included reports of hydrogeologic investigations performed in the region (Plantz, 1983; Sandberg, 1979) and reports of spring and seep surveys and baseline monitoring activities performed by Utah

International, Inc. as part of a previous coal mining application in the Alton Coal Field submitted to the Utah Division of Oil, Gas and Mining (Utah International, 1988).

Aerial Photo-Imagery

High resolution aerial photographs of the study area were obtained and analyzed. Those areas identified as potential spring and seep locations based on the analysis of the aerial photography were noted and marked for field checking for the presence of springs or seeps.

Landowner Consultation

Interviews with local landowners were carried out to gain information on spring and seep locations in the region and to determine the importance of individual springs and seeps for water usage among the landowners in the area.

Water Rights Search

An inventory of Utah appropriated water rights in the study area was carried out to determine the locations of those springs with associated water rights.

Field Survey

The land surface within the spring and seep survey area was traversed and spring and seep locations were identified. Some areas with difficult access, including portions of the steep, rugged mountainous regions immediately north and east of the proposed mine permit area were surveyed from a helicopter and evaluated using aerial imagery.

Information collected at each spring or seep monitoring event, including discharge measurement details and water quality data were recorded in field notebooks.

Spring and Seep Locations

Thirty-two springs and seeps were identified in the Coal Hollow Project area. Identified springs and seeps were assigned a unique spring identification number, consisting of an SP- prefix followed by a one or two digit number. Springs SP-3, SP-4, SP-5, SP-6, and SP-8 were previously assigned their spring numbers as part of the Utah International baseline monitoring activities. Other springs identified in this survey were arbitrarily assigned SP- numbers, beginning with number SP-14.

Spring and seep locations were determined in the field using a Garmin 3+ GPS unit and recorded. Location data were compiled into an electronic database. Spring and seep locations were then plotted on a base map of the 7.5 minute Alton, Utah quadrangle in electronic format.

Discharge Measurements

Typically, discharge measurements for springs and seeps were performed using a calibrated container and a stopwatch. Spring discharge measurements were performed by diverting the spring discharge through a pipe. Using an appropriately sized container, time-to-fill measurements were typically performed at least 3 times at each location. An average time-to-fill value was recorded in the field notebook and later used to calculate the reported discharge measurement. During monitoring events at some seeps where

only minor, diffuse seepage was occurring and the discharge from the spring could not be collected for a discharge measurement, discharges were estimated.

Discharge Temperature Measurements

Discharge temperature measurements were performed using a Taylor brand electronic digital thermometer. Discharge temperature measurements at springs were performed as close to the spring discharge locations as possible.

Specific Conductance Measurements

Specific conductance measurements were performed using an Extech brand model EC400 conductivity meter with automatic temperature compensation. The instrument was regularly calibrated using traceable ASTM conductivity standard solutions.

pH Measurements

pH Measurements were performed using an Oakton brand Acorn 6 model electronic pH meter with automatic temperature compensation or an Oakton pHTestr model 30 pH meter with automatic temperature compensation. The instruments were regularly calibrated using traceable ASTM pH standard solutions.

Climate

A plot of the Palmer Hydrologic Drought Index for Utah Region 4 (which includes the Coal Hollow Project area) is presented in Figure 2. The PHDI is a monthly value generated by the National Climatic Data Center that indicates wet and dry spells. The PHDI is calculated from

several hydrologic parameters including precipitation, temperature, evapotranspiration, soil water recharge, soil water loss, and runoff. Consequently, it is a useful tool for evaluating the relationship between climate and groundwater and surface water discharge data. The PHDI is useful for determining whether variations in spring and stream discharge rates are the result of climatic variability or whether they are the result of other factors.

It is apparent in Figure 2 that, beginning in late 2004, the region transitioned from the previous prolonged period of drought into a period of wetness that persisted throughout 2005 and most of 2006. During 2007, the region experienced a period of mild to moderate drought. During 2008, the region has experienced near-normal climatic conditions.

Presentation of Data

The locations of springs and seeps identified in the Coal Hollow Project spring and seep survey area are shown on Plate 1. Spring and seep locations (UTM, Zone 12, NAD 27 coordinates), discharge elevations, associated geologic formations, and uses are presented in tabular form in Table 1. Spring and seep seasonal discharge measurements and field water quality measurements are presented in Table 2. A plot of the Palmer Hydrologic Drought Index (PHDI) for Utah Region 4 is presented in Figure 2.

Discussion and Conclusions

Most of the springs identified in the project and adjacent area discharge from alluvial groundwater systems in Sink Valley. It is readily apparent that most of the groundwater

discharge in the Coal Hollow Project area is derived from these alluvial groundwater systems, with a much lesser amount coming from other sources.

Two springs (SP-3 and SP-5) discharge from pediment alluvium in the upland region to the southeast of the project area.

Two springs (SP-4 and SP-34) discharge in the lower Sink Valley wash area. Spring SP-4 likely discharges from a fault or fracture in the Dakota Formation, while SP-34 discharges from colluvial sediments overlying the Dakota Formation.

Spring SP-27 has discharged as a seep from the Dakota Formation during wet periods only. When monitored during 2005, the discharge from SP-27 was black in color with moderately elevated salinity (specific conductance of about 4,600 uS/cm). This seep may be associated with the burned Dakota Formation coal seam present near the spring discharge location.

Spring SP-37 seeps at a low discharge rate (<0.1 gpm) from alluvial/colluvial sediments overlying a sandy member of the Tropic Shale along the eastern edge of Sink Valley.

Three of the identified seeps (SP-36, SP-38, and SP-39) are likely associated with shallow, seasonal snowmelt waters moving as interflow or through the soil zone and do not appear to be associated with appreciable groundwater systems. Two of these springs (SP-36 and SP-39) are located near the top of the Tropic Shale ridge east of the Sink Valley Fault in Section

20, T39S, R5W. Spring SP-38 discharge from shallow sediments in an unnamed tributary to Sink Valley Wash south about ½ mile south of the proposed permit area (Plate 1).

Bank seepage along the Lower Robinson Creek stream channel is commonly present in the southwest corner of Section 19, T39S, R5W (Plate 1). The bank seepage water is likely alluvial groundwater that seeps to the surface where the incised stream channel intersects the potentiometric surface of the alluvial groundwater system. Because of the seasonal changes in the elevation of the potentiometric head in the alluvial groundwater system, the location of the bank seepage is variable over time (i.e. the variability in the bank seepage locations are likely controlled primarily by temporal variability in potentiometric levels in the alluvial groundwater system rather than by fixed, permeability-controlled groundwater preferential pathways in the aquifer skeleton).

Three of the springs identified in this spring and seep survey are utilized seasonally for domestic water sources. These include spring SP-8 (Swapp ranch house), SP-33 (Johnson cabin), and SP-35 (Sorensen ranch house). Some springs provide water for wildlife or stockwatering as detailed in Table 1.

References Cited

Plantz, G.G., 1983, Selected hydrologic data, Kolob-Alton-Kaiparowits coal-fields area, south-central Utah, U.S. Geological Survey Open-File Report, 83-871.

Sandberg, G.W., 1979, Hydrogeologic evaluation of the Alton coal field, Utah, U.G. Geological Survey Open-File Reporft 79-346, 53 p.

Utah International, Inc, Baseline hydrologic monitoring reports.

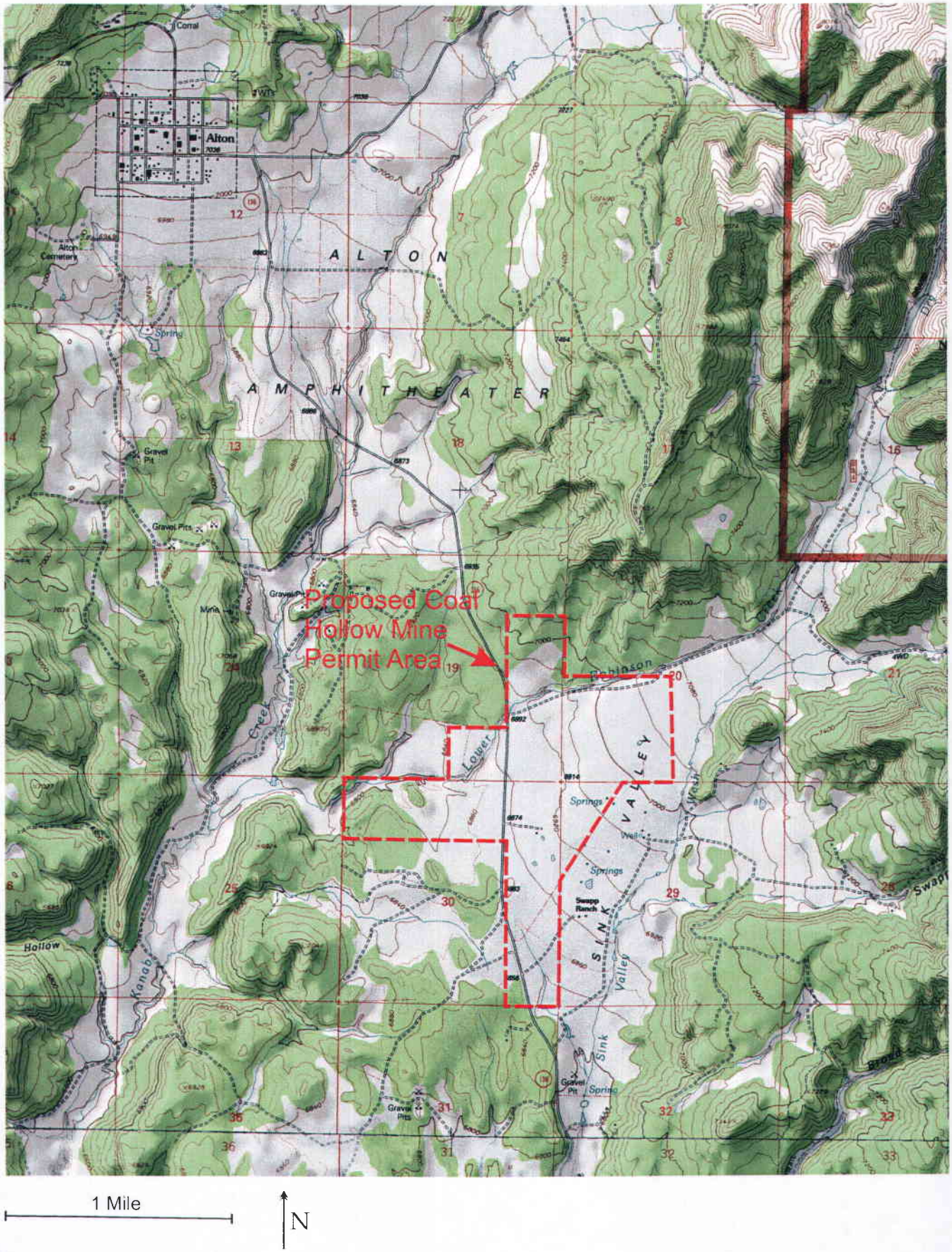
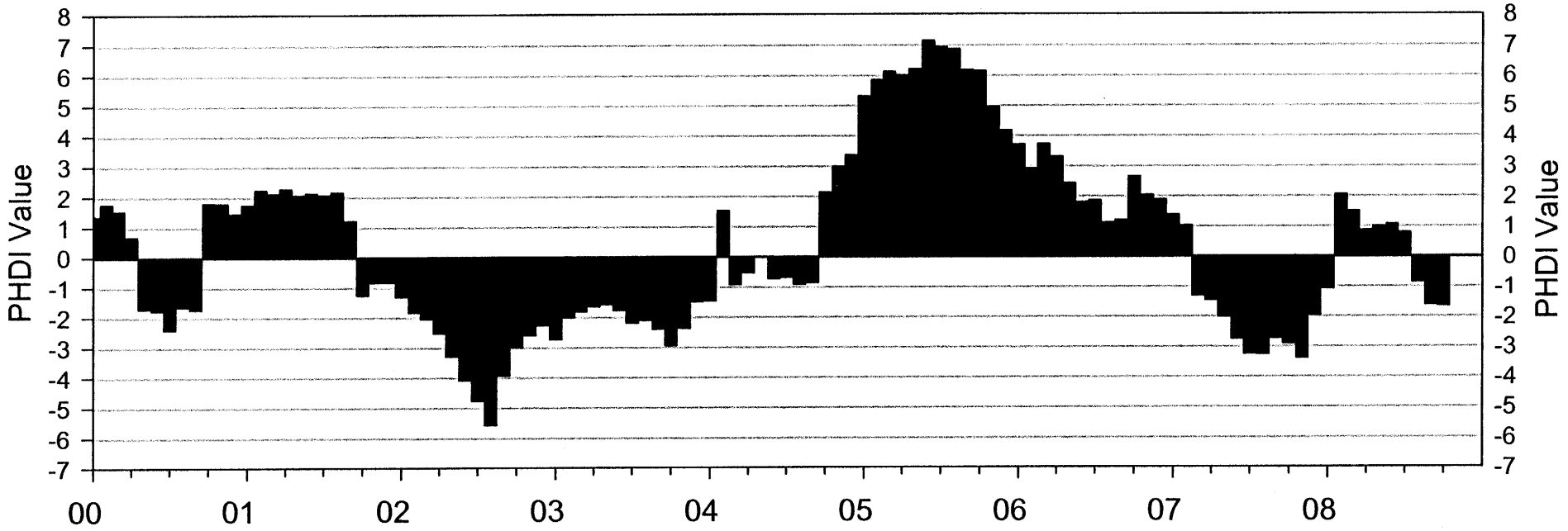


Figure 1 Location map of proposed Coal Hollow Mine permit and surrounding area and the town of Alton, Utah.



-1 to -2 Mild Drought	1 to 2 Mild Wet Spell
-2 to -3 Moderate Drought	2 to 3 Moderate Wet Spell
-3 to -4 Severe Drought	3 to 4 Severe Wet Spell
-4 to -5 Extreme Drought	4 to 5 Extreme Wet Spell

Figure 2 Plot of Palmer Hydologic Drought Index for Utah Region 4.

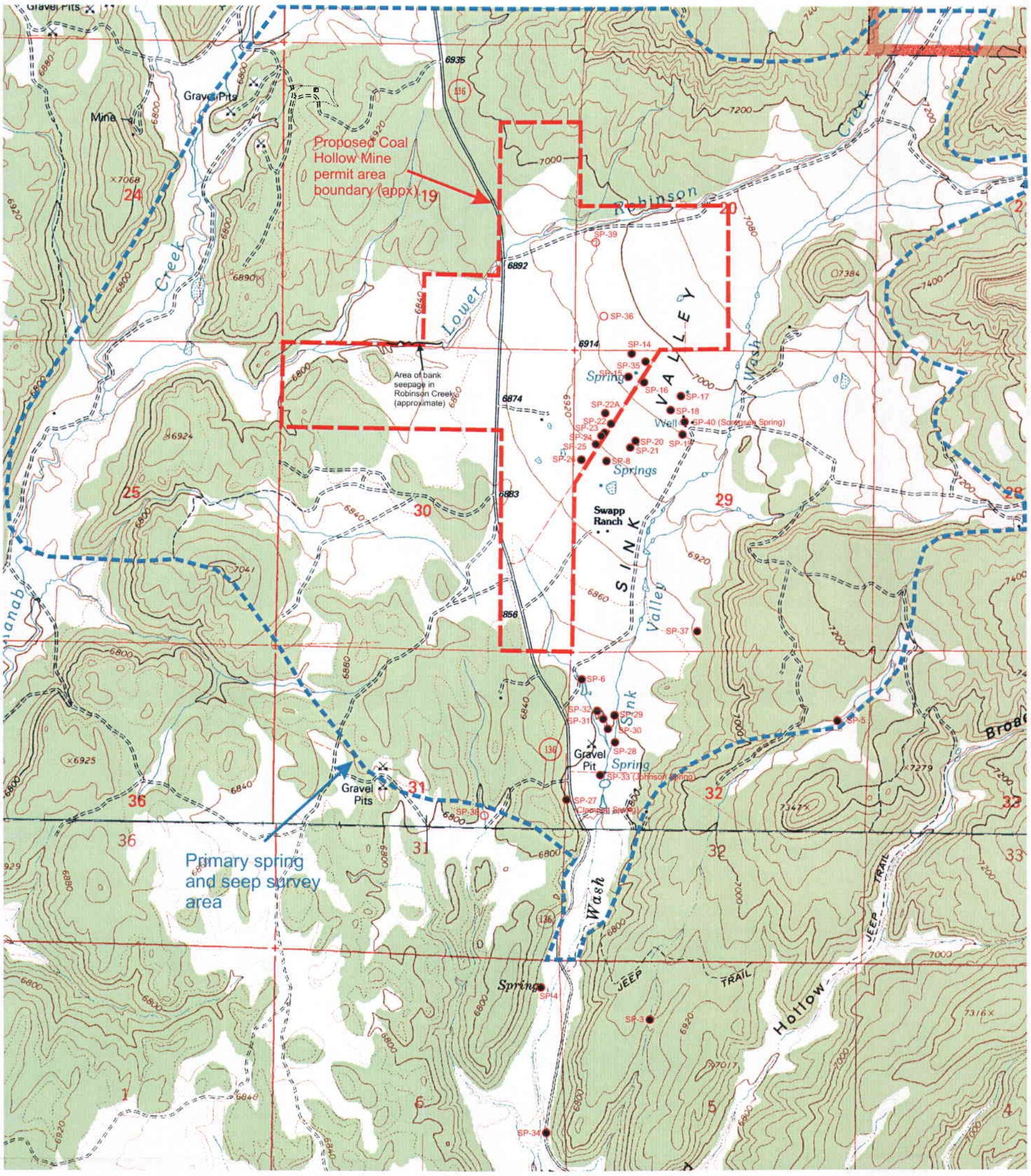


Plate 1 Coal Hollow Project spring and seep locations.

Table 1 Spring and seep locations and details, Coal Hollow Project.

Petersen Hydrologic, LLC

Coal Hollow Table B-1.xls 29 Nov 2008

	Alternate Name	UTM location Z12, NAD 27		Elevation (approx)	Drainage basin	Geologic Formation	Uses
SP-3		4136009	372028	6882	lower Sink Valley Wash	Pediment alluvium	Wildlife, contritubes to stream flow
SP-4		4136427	371531	6700	lower Sink Valley Wash	Dakota/fault ?	Stock watering
SP-5		4137820	373080	7215	Sink Valley (pediment)	Pediment alluvium	None apparent
SP-6		4137977	371717	6829	Sink Valley	Alluvium	Stock watering, wildlife
SP-8		4139231	371861	6920	Sink Valley	Alluvium	Domestic, stock watering, wildlife
SP-14		4139790	372023	6985	Sink Valley	Alluvium	Stock watering, wildlife
SP-15		4139660	371960	6980	Sink Valley	Alluvium	Stock watering, wildlife
SP-16	Teal Spring	4139656	372035	6980	Sink Valley	Alluvium	Stock watering, wildlife
SP-17		4139559	372236	6970	Sink Valley	Alluvium	None apparent
SP-18		4139486	372196	6965	Sink Valley	Alluvium	None apparent
SP-19	Sorensen Pond Spring	4139384	372256	6960	Sink Valley	Alluvium	Stock watering
SP-20		4139325	372014	6940	Sink Valley	Alluvium	Stock watering, wildlife
SP-21		4139289	371980	6940	Sink Valley	Alluvium	Wildlife
SP-22		4139423	371863	6940	Sink Valley	Alluvium	Wildlife
SP-22A		4139479	371841	6940	Sink Valley	Alluvium	Wildlife
SP-23	Spring House Spring	4139382	371838	6935	Sink Valley	Alluvium	Wildlife
SP-24		4139356	371822	6920	Sink Valley	Alluvium	Wildlife
SP-25		4139322	371798	6920	Sink Valley	Alluvium	wildlife
SP-26		4139211	371717	6920	Sink Valley	Alluvium	Stock watering, wildlife
SP-27	Clampett Spring	4137416	371645	6800	Sink Valley	Dakota Formation	None apparent
SP-28	Seep #1	4137718	371896	6790	Sink Valley	Alluvium	Wildlife
SP-29	Seep #2	4137853	371885	6800	Sink Valley	Alluvium	Wildlife
SP-30	Seep #3	4137787	371852	6800	Sink Valley	Alluvium	None apparent
SP-31	Seep #4	4137764	371830	6800	Sink Valley	Alluvium	None apparent
SP-32	Seep #5	4137864	371810	6800	Sink Valley	Alluvium	Stock watering, wildlife
SP-33	Johnson Spring; Pulsifer Sp.	4137543	371788	6785	Sink Valley	Alluvium	Domestic, stock watering, wildlife
SP-34		4135632	371512	6660	Lower Sink Valley Wash	Colluvium/Dakota	None apparent
SP-35		4139747	372051	6980	Sink Valley	Alluvium	Stockwatering, wildlife
SP-36		4139979	371830	6970	Sink Valley	Alluvium	None apparent
SP-37		4138266	372316	6885	Sink Valley	Alluvium/fracture?	Stock watering, wildlife
SP-38		4137343	371182	6780	Lower Sink Valley Wash	Alluvium	None apparent
SP-39		4140385	371786	6960	Lower Robinson Creek	Alluvium	None apparent
SP-40	Sorensen Spring	4139419	372238	6965	Sink Valley	Alluvium	Drinking water for Sorensen ranch

Table 2 Spring and seep discharge and water quality data, Coal Hollow Project

Petersen Hydrologic, LLC

Coal Hollow Table B-2 Spring and Seep.xls 29 Nov 2008

Spring	Date	Discharge (gpm)	T (°C)	pH	Sp. Cond. (µS/cm)
SP-3	18-Jun-05	5.94	9.8	7.43	658
	24-Sep-05	7.23	9.5	7.58	777
	3-Nov-05	6.82	9.5	7.42	703
	30-Mar-06	7.37	9.9	7.48	703
	29-May-06	7.73	9.5	7.57	747
	8-Sep-06	7.52	9.4	7.57	662
	20-Dec-06	7.28	9.1	7.59	667
	29-Mar-07	7.65	9.3	7.49	697
	30-Sep-07	7.01	9.2	7.58	615
	29-Dec-07	6.86	8.9	7.58	637
	17-Jun-08	6.74	9.6	7.20	631
	20-Aug-08	6.38	9.6	7.20	691
SP-4	18-Jun-05	0.96	11.1	7.48	961
	24-Sep-05	0.72	12.5	7.47	990
	3-Nov-05	0.76	10.6	7.61	984
	30-Mar-06	0.64	8.6	7.7	955
	29-May-06	0.85	11.3	7.76	972
	7-Sep-06	0.696	12.1	7.46	894
	21-Dec-06	0.59	7.9	7.79	871
	30-Mar-07	0.81	8	7.77	904
	30-Sep-07	0.55	11.6	7.56	870
	29-Dec-07	0.48	8.6	7.78	781
	22-Mar-08	0.94	7.5	7.39	971
	17-Jun-08	0.73	12.1	7.36	936
	20-Aug-08	0.61	13.0	7.39	954
SP-5	18-Jun-05	Dry	---	---	---
	12-Aug-05	Damp	---	---	---
	24-Sep-05	Dry	---	---	---
	30-May-06	Dry	---	---	---
SP-6	17-Jun-05	Seep	19.2	8.5	804
	24-Sep-05	Seep	16.0	7.41	1310
	3-Nov-05	Seep	10.5	7.76	1602
	30-Mar-06	Area innundated with snowmelt runoff			
	16-May-06	Seep	18.7	8.21	1918
	29-May-06	Seep	25.2	8.12	1475
	7-Sep-06	Seep	15.4	7.53	1038
	30-Dec-06	Seep	5.6	7.91	1175
	30-Mar-07	Seep	2.2	8.46	2920
	30-Sep-07	Seep	12.0	7.53	1044
	30-Dec-07	Seep	6.1	7.6	710
	22-Mar-08	Area innundated with snowmelt runoff			
SP-8	27-May-05	17.6	10.3	7.89	642
	24-Sep-05	9.1	9.6	7.27	704
	4-Nov-05	12.8	9.6	7.48	706
	31-Mar-06	20.3	9.3	7.5	716
	16-May-06	19.1	9.7	7.42	726

Spring	Date	Discharge (gpm)	T (°C)	pH	Sp. Cond. (µS/cm)
	29-May-06	14.0	10.5	7.75	701
	30-Dec-06	19.3	8.1	7.79	668
	15-Jan-07	19.4	---	---	---
	29-Mar-07	19.6	9.4	7.5	696
	30-Sep-07	18.7	9.8	7.45	651
	30-Dec-07	15.9	8.0	7.47	594
	22-Mar-08	17.0	7.7	7.21	687
	18-Jun-08	18.1	11.0	7.15	613
	21-Aug-08	16.9	11.1	7.25	707
SP-14	16-May-06	6.3	12.7	7.83	734
	31-Mar-06	5.77	8.6	7.4	708
	16-May-06	6.3	12.7	7.83	734
	8-Sep-06	5.21	15.1	7.18	674
	21-Dec-06	4.39	5.2	7.85	669
	30-Dec-06	7.21	8.9	7.93	666
	15-Jan-07	4.49	---	---	---
	28-Mar-07	4.24	4.7	7.82	673
	22-Jun-07	2.53	22.6	7.56	794
	29-Sep-07	2.13	9.4	7.91	676
	30-Dec-07	4.6	3.6	7.83	552
SP-15	10-Nov-05	0.57	9.1	7.44	715
	16-May-06	0.9	11.1	7.71	733
	21-Dec-06	1.31	8.5	7.63	731
	30-Dec-06	0.14	7.5	8.12	652
	22-Jun-07	0.78	10.4	7.62	722
	30-Sep-07	0.28	20.4	7.31	839
	21-Aug-08	0.24	19.8	7.26	743
SP-16	4-Nov-05	1.35	6.7	7.3	692
	25-Jan-06	1.00	4.3	7.59	695
	16-May-06	0.98	11.9	7.42	737
	29-May-06	0.86	10.5	7.68	712
	29-May-06	0.86	10.5	7.68	712
	30-Dec-06	0.35	5	7.86	672
	29-Mar-07	0.88	8.2	7.66	719
	30-Dec-07	1.52	6.2	7.51	580
SP-17	16-May-06	Seep	---	---	---
	21-Dec-06	Dry	---	---	---
SP-18	16-May-06	Seep	9.6	7.46	700
	21-Dec-06	Dry	---	---	---
SP-19	4-Nov-05	Seep	8.7	8.07	779
	31-Mar-06	0.33	8.9	7.58	699
	16-May-06	0.24	9.3	7.53	730
	21-Dec-06	Area innundated with snowmelt runoff			
	22-Jun-07	<0.1	10.3	7.75	715
	29-Sep-07	0.14	10.2	7.76	639
	30-Nov-07	0.19	9.4	7.13	482
	18-Jun-08	<0.25	9.6	7.08	635
	21-Aug-08	<0.1	17.8	7.23	611
SP-20	31-Mar-06	5.95	9.3	7.66	696

Spring	Date	Discharge (gpm)	T (°C)	pH	Sp. Cond. (µS/cm)
	16-May-06	6.76	9.5	7.39	704
	15-Jan-07	9.87	---	---	---
	29-Mar-07	10.3	9.4	7.55	685
	22-Jun-07	10.5	9.9	7.62	691
	29-Sep-07	9.43	9.6	7.5	617
	30-Dec-07	10.1	9.3	7.52	606
	18-Jun-08	9.43	9.7	7.14	618
	21-Aug-08	8.64	9.9	7.29	688
SP-21	16-May-06	0.98	9.6	7.43	709
	29-May-06	0.85	9.5	7.78	680
SP-22	10-Nov-05	Seep	9.9	7.56	725
	16-May-06	Seep	9.3	7.38	780
	21-Dec-06	0.1	8.1	7.66	636
	22-Jun-07	<0.1	19.9	7.57	737
	30-Sep-07	<0.1	11.4	7.51	676
	29-Nov-07	0.41	7.9	7.39	612
	18-Jun-08	0.31	14.7	7.41	654
	21-Aug-08	<0.1	20.1	7.57	740
SP-22A	10-Dec-08	Seep	---	---	---
SP-23	10-Nov-05	Seep	10	7.33	736
	16-May-06	0.84	9.2	7.38	735
	21-Dec-06	0.38	9	7.57	725
	22-Jun-07	0.82	9.9	7.61	712
	30-Sep-07	0.60	10	8.4	673
	29-Nov-07	1.26	9.5	7.34	635
	18-Jun-08	0.88	9.9	8.21	627
	21-Aug-08	0.84	9.9	7.32	688
SP-24	10-Nov-05	Seep	8.6	7.45	1324
	16-May-06	Seep	12.5	7.42	1241
	21-Dec-06	0.1	8.4	7.88	695
	22-Jun-07	Damp	---	---	---
	22-Jun-07	Damp	---	---	---
	30-Sep-07	<0.1	11.3	8.69	831
	29-Nov-07	0.27	7.6	7.39	631
	18-Jun-08	<0.25	10.4	7.29	638
	21-Aug-08	<0.1	13.5	7.52	694
SP-25	10-Nov-05	Seep	9.4	7.47	911
	16-May-06	0.21	12.2	7.49	1083
	21-Dec-06	0.33	3	7.88	756
	22-Jun-07	Damp	---	---	---
	30-Sep-07	< .1	7.2	7.79	1012
	29-Nov-07	0.47	2.9	7.35	709
	18-Jun-08	Damp	---	---	---
	21-Aug-08	<0.05	18.7	7.62	773
SP-26	10-Nov-05	Seep	9.6	7.4	738
	16-May-06	1.5	9.6	7.44	742
	21-Dec-06	0.36	6.7	7.86	710
	22-Jun-07	<0.1	29.5	7.94	887

Spring	Date	Discharge (gpm)	T (°C)	pH	Sp. Cond. (µS/cm)
	30-Sep-07	<0.1	18	7.91	1022
	29-Nov-07	0.65	8.6	7.36	620
	18-Jun-08	0.87	9.7	7.16	643
	21-Aug-08	<0.1	13.8	7.42	735
SP-27	17-Jun-05	0.50	16.6	8.94	4,580
	3-Nov-05	Seep	7.8	8.52	4,640
	21-Dec-06	Dry	---	---	---
	29-Mar-07	Dry	---	---	---
	20-Jun-07	Dry	---	---	---
	30-Sep-07	Dry	---	---	---
	17-Jun-08	Dry	---	---	---
	20-Aug-08	Dry	---	---	---
	27-Aug-08	Dry	---	---	---
SP-28	17-Jun-05	Seep	23	7.99	2110
	12-Aug-05	Dry	---	---	---
	3-Nov-05	Dry	---	---	---
	16-May-06	Dry	---	---	---
	21-Dec-06	Dry	---	---	---
	30-Mar-07	Dry	---	---	---
	20-Jun-07	Dry	---	---	---
	17-Jun-08	Dry	---	---	---
	20-Aug-08	Dry	---	---	---
SP-29	17-Jun-05	Seep	17.4	7.58	2570
	12-Aug-05	Dry	---	---	---
	3-Nov-05	Dry	---	---	---
	16-May-06	Seep	12.4	7.35	2740
	21-Dec-06	Dry	---	---	---
	30-Mar-07	<0.1	13.5	7.62	2380
	20-Jun-07	Dry	---	---	---
	17-Jun-08	Dry	---	---	---
	20-Aug-08	Dry	---	---	---
SP-30	17-Jun-05	Seep	20.9	7.98	2940
	12-Aug-05	Dry	---	---	---
	3-Nov-05	Dry	---	---	---
	16-May-05	Seep	15.8	8.45	3180
	21-Dec-06	Dry	---	---	---
	30-Mar-07	<0.1	14.7	7.86	3550
	20-Jun-07	Dry	---	---	---
	17-Jun-08	Dry	---	---	---
	20-Aug-08	Dry	---	---	---
SP-31	17-Jun-05	Seep	21.7	8.61	3080
	12-Aug-05	Dry	---	---	---
	3-Nov-05	Dry	---	---	---
	16-May-06	Seep	13.7	8.49	4150
SP-32	17-Jun-05	Seep	22.2	9.1	2690
	12-Aug-05	Dry	---	---	---
	3-Nov-05	Dry	---	---	---
	16-May-06	0.2	17.8	8.34	2910
	21-Dec-06	Dry	---	---	---
	30-Mar-07	0.33	10.3	7.99	2060

Spring	Date	Discharge (gpm)	T (°C)	pH	Sp. Cond. (µS/cm)
	20-Jun-07	<0.1	19.5	8.26	3640
	17-Jun-08	Dry	---	---	---
	20-Aug-08	Dry	---	---	---
SP-33	17-Jun-05	13.2	9.1	7.87	1148
	24-Sep-05	4.37	11.2	7.79	1386
	3-Nov-05	4.36	10.6	7.86	1031
	30-Mar-06	9.43	7.6	7.96	1254
	21-Apr-06	---	8.0	7.97	1293
	29-May-06	8.98	9.0	7.96	1239
	8-Sep-06	3.11	11.6	7.85	1208
	21-Dec-06	4.36	8.8	7.98	1197
	30-Mar-07	9.2	7.6	7.97	1185
	30-Sep-07	2.86	11.9	7.98	1186
	29-Dec-07	4.16	9.0	7.98	1111
	22-Mar-08	119	8.2	7.49	1252
	17-Jun-08	14.0	9.4	7.71	1131
	20-Aug-08	11.1	5.51	7.69	1208
SP-34	16-May-06	Seep	13	7.04	2470
	20-Dec-06	Dry	---	---	---
	20-Jun-07	Dry	---	---	---
	30-Sep-07	Dry	---	---	---
	17-Jun-08	<0.1	14.1	7.06	2440
	20-Aug-08	<0.05	12.9	7.55	2000
SP-35	29-May-06	0.21	9.5	7.62	706
	21-Dec-06	0.23	8.6	7.78	664
	22-Jun-07	<0.1	10.1	7.64	706
	21-Aug-08	<0.05	13.3	7.35	699
SP-36	1-Feb-07	5 est.	---	---	---
	21-Jun-07	<0.05	16.5	7.89	1771
SP-37	2-Jan-07	<0.1	6.2	9.19	1035
	30-Mar-07	0.1	5.8	8.98	1191
	20-Aug-08	<0.1	14.3	8.22	1226
SP-38	17-Jun-08	<0.1	---	---	---
SP-39	22-Jun-07	Damp soil	---	---	---
	29-Sep-08	<0.05	14.1	7.76	2,640
	18-Jun-08	Damp soil	---	---	---
SP-40 Sorensen Spring	12-Aug-05	0.05	13.8	7.11	651
	4-Nov-05	0.061	9.4	7.43	681
	29-May-06	0	12.1	7.01	694
	8-Sep-06	0	10.8	7.67	663
	20-Dec-06	0	8.2	7.52	655
	29-Sep-07	<0.25	11.3	7.72	623
	30-Dec-07	0.31	8.2	7.43	600
	22-Mar-08	0.33	8.6	7.30	658
	18-Jun-08	0.28	16.7	7.83	676
Robinson Creek bank seepage area	29-Mar-07	5.24	1.4	8.57	1534
	22-Jun-07	1.49	28.8	8.59	1386

Spring

Date	Discharge (gpm)	T (°C)	pH	Sp. Cond. (µS/cm)
30-Sep-07	3.61	16.0	8.38	1464
17-Jul-08	4.05	19.3	8.50	1481
20-Aug-08	2.75	23.3	8.47	1302

Instructions:

Insert this new Appendix 7-8 in the Confidential Binder volume 7.

APPENDIX 7-8

Water rights agreement with the town of Alton, Utah

EXCESS WATER USE AGREEMENT

THIS EXCESS WATER USE AGREEMENT ("Agreement") is made this 27 day of June, 2007, by and between **Alton Town, Inc.** a municipal corporation under the laws of the State of Utah, (hereafter "**Town**"), with a mailing address of P.O. Box 100781, Alton, Utah, 84710-0781 and **Alton Coal Development, LLC** (hereafter "**Company**"), with a mailing address of P.O. Box 1230, Huntington, Utah, 84528

RECITALS

A. WHEREAS Town owns certain underground water which point of diversion is located in or about the Town Premises, said water rights currently having the capability of producing water in excess of the Town's current need or immediate future demand; and

B. WHEREAS, in order for the Town to preserve its interest in the excess water and to avoid a potential forfeiture, and to assure that the same has been put to beneficial use, the Town has resolved that the water should be temporarily delivered to Company for temporary beneficial use; and

C. WHEREAS Company desires to use said water for mining purposes which shall be a beneficial purpose to the Town; and

D. WHEREAS the Town of Alton has excess water whereby it desires to temporarily distribute said excess water outside its boundary limits for a fee and for the financial benefit of its citizens, provided said water is not required by Town residents; and

E. WHEREAS Company has been placed on notice that in the event there is a water shortage, state law requires that all users of Town water outside of Town limits are required to be terminated ; and

F. WHEREAS the Company and Town, (hereafter collectively referred to as "Parties"), desire to enter into an agreement for the Parties mutual benefit; and

G. WHEREAS both parties represent that all dealings with this matter shall be with full disclosure; and

NOW, THEREFORE, based upon the mutual covenants and promises hereinafter set forth, the parties agree as follows:

1. **Delivery of Water.** Pursuant to the Town's authority to deliver and provide public water services, both inside and outside of Town limits, Town agrees to permit Company to utilize, at Company's own maintenance, outlay and cost, a total of Fifty (50) acre feet of water per year, from underground water right number 85-771. Company shall have the right, at its option, to draw the water from one of the following sources:

(a) an existing well located upon the Sorensen Ranch; or

(b) drill a new well at a location convenient to the Company; or

(c) from water generated at the mine site from the Mining Operations conducted by the Company.

Regardless of location of the Water Source utilized by the Company, the Company shall be responsible for the purchase and acquisition of all easements necessary to bring the water to the Company, or to make the Well accessible to the Company for its use and the Company agrees to pay all of its costs to transport the water from the point of diversion to its place of use of the water in its mining and other related operations.

2. **Execution Fee.** The Company, for and in consideration of the execution and simultaneously with the delivery of this Excess Water Use Agreement, shall pay unto the Town the sum of as a one time Execution Fee for the right to the use

of Fifty (50) acre feet of Town water rights, the receipt and sufficiency of which is hereby acknowledged by Town. The Execution Fee is a single, lump sum fee, which is not recoupable for any purpose(s), hereunder.

3. **Change Applications.** Town acknowledges that a temporary change application(s) must be filed with the Utah State Division of Water Rights (Division). The Town will expeditiously file and process all necessary applications and obtain all necessary permits or amendments to all applicable water permits to allow Company to divert the water sought by the Company. Company will support the filing and approval of the application(s).

(a) Further, in the event that Company elects to do so, Town will cooperate with Company by filing a change application(s) on behalf of Company seeking approval to move the fifty (50) acre-feet of water to an underground water well to be located and used by Company near the coal processing facility in Sink Valley or to the mine site pit.

(b) The Parties recognize that no water can be diverted from the new water sources and beneficially used without first receiving approval of the application(s) from the State Engineer which shall be accomplished by Town.

4. **Documentation of Use.** Company agrees to utilize the water for mining and other related purposes and while using the same, shall keep records of the location, purpose and amount of water utilized, and deliver said records to Town on or before July 1st of each year, with the first report due July 1, 2008 and thereafter so long as this Excess Water Use Agreement is in effect.

5. **Consideration for Use and Delivery of Water.** In consideration for use of Town's water, and in addition to the one time Execution Fee, Company agrees to pay

per acre foot per year for each acre foot of water used by Company, as compensation for the temporary use and enjoyment of said water for that one (1) year period. Payment shall be made

on a fiscal year basis with the same being payable on or before July 1st of each year for the year ending June 20th, with the first annual payment due and payable no later than July 1, 2008, and continuing each year thereafter until this Excess Water Use Agreements and the right of Company to draw water either terminates or expires.

6. **Abatement and Termination of Water Use.** In the event of a water shortage, Town will provide one hundred eighty (180) days written notice of its intent to abate the right of Company to divert water for its own purposes until the Town determines that the water shortage is resolved or this Excess Water Use Agreement is otherwise terminated.. Company or Town may, with or without cause and with eighty (180) days written or verbal notice, terminate this Excess Water Use Agreement and relinquish its right to diversion and use of said water. If either Company or Town terminates use of the water, the Parties waive any claim for reimbursement.

7. **Use of Water.** This agreement is to be construed and is drafted in accordance with Article 11, Section 6 of the Utah State Constitution. This agreement does not constitute a sale, lease, alienation or disposal of water rights, but rather a delivery of excess or surplus water for temporary use by Company and only for so long as Town deems the same to be appropriate and in the best interest of its citizens.

8. **Exclusion of Warranty or Representations.** Town makes no representation as to the water supply, either quality or quantity, and each party represents to the other that no verbal representations have been made.

9. **Option**. There is an existing well that is located at UTM NAD 27 coordinates of N4144990 E371043, owned by the Town (the "Town Well") in which the Town grants to the Company the option to use up to an additional Fifty (50) acre feet of excess water per year from that source, in addition to the water set out in section 1 above ("Additional Water"). In the event that

the Company shall require more than the Fifty (50) acre feet of water per year provided for by this Excess Water Agreement, the Company shall have the right, upon (30) days written notice of its desire, to obtain use of the Additional Water. In the event that Company desires to exercise its right to the use of the additional Fifty (50) acre feet of water, then Company will be subject to the additional following terms and conditions:

(a) Company shall pay unto the Town the sum of

as a one time Additional Use Fee for the right to use Fifty (50) acre feet of Additional Water derived from the water rights associated with the Town Well, with payment to be made simultaneously with the delivery of the notice by Company of its intention to exercise its right to the use of Additional Water.

(b) Upon approval of the Application for Temporary Change for the additional fifty (50) acre feet, Company will be required to refurbish and restore the Town Well to operating condition at its sole expense. The work will be done in a workman like fashion using appropriate parts and materials to complete the work in a manner to return the Town Well to a producing condition, which will allow for water flow to cultivated fields, irrigation pond, or City water tanks at the direction of Town. The work to refurbish and restore the Town Well will include, but not be limited to the following necessary items:

(i) Replacement of the submersible water pump;

(ii) Clean out well (if necessary);

(iii) Repair any and all electrical service required to run pump;

(iv) Repair pump building; and

(v) Repair pump valving.

(c) So long as Company is utilizing the Town's water well, then Company shall have the responsibility to maintain the well and pump. Company shall also have the responsibility to maintain the delivery system to Company's point of use which is being utilized for the sole benefit of Company. Company shall assure that the water is utilized for beneficial purposes and shall not commit waste of said water such that a claim on lack of beneficial use may be raised.

(d) In consideration for use of the additional water source, Company agrees to pay per acre foot per year for each acre foot of water used by Company, derived from the additional water source as compensation for the temporary use and enjoyment of said Additional Water for that one (1) year period. The annual payments shall be made at the same time as the annual payments to Town for the base water source.

(e) Town will acknowledge the right of Company to draw the additional water from a new point of diversion designated by Company, with the precise diversion point to be designated by Company at the time it give its notice of intent to draw the Additional Water.

10. **Miscellaneous Terms.**

(a) **Entire Agreement.** This Agreement embodies the entire agreement between the parties and cannot be varied except by the written agreement of the parties.

(b) **Survival.** All representations, warranties, covenants, obligations and agreements contained herein shall survive the execution and delivery hereof.

(c) **Time of Essence.** Time is of the essence of this Agreement.

(d) **Notices.** Any notice required or permitted to be delivered hereunder shall be deemed to be delivered (i) when delivered, if personally delivered or by an overnight or other courier service, or (ii) whether or not actually received, when deposited in the United States mail, postage prepaid,

certified mail, return receipt requested, addressed to Seller or Purchaser, as the case may be, at the address set opposite the signature of such party hereto.

(e) **Successors and Assigns**. All of the terms and conditions of this Agreement are hereby made binding on the successors and permitted assigns of both parties hereto.

(f) **Gender, Numbers**. Words of any gender used in this Agreement shall be held and construed to include any other gender, and words in the singular number shall be held to include the plural and vice versa unless the context requires otherwise.

(g) **Headings**. The captions used in connection with the articles and sections of this Agreement are for convenience only and shall not be deemed to construe or limit the meaning of the language of this Agreement.

(h) **Effective Date**. All references to the "date of this Agreement" or the "date hereof" or similar references shall be deemed to mean the date first written above.

(i) **Governing Law**. THIS AGREEMENT SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF UTAH; AND PERFORMANCE AND VENUE SHALL BE IN KANE COUNTY.

(j) **Holidays**. If the final date of any period provided for herein for the performance of an obligation or for the taking of any action falls on a Saturday, Sunday or banking holiday, then the time of such period shall be deemed extended to the next day which is not a Saturday, Sunday or banking holiday.

(k) **Attorneys' Fees**. In the event that a legal action is brought to enforce the terms of this Agreement, the prevailing party shall be entitled to collect its costs of court, including reasonable attorneys' fees.

(l) **Interpretation**. The parties acknowledge that each party and its counsel have reviewed this Agreement and that the normal rule of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be employed in the interpretation of this Agreement or any amendments of exhibits hereto.

(m) **Severability**. If any provisions of this Agreement are held to be illegal, invalid or unenforceable under present or future laws, such provision shall be fully severable, and this Agreement shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part of this Agreement, and the remaining provisions of this Agreement shall remain in full force and effect and not be affected by the illegal, invalid or unenforceable provision or by its severance from this Agreement, provided that both parties may still effectively realize the complete benefit of the transaction contemplated hereby.

(n) **Amendments**. No modification or amendment of this Agreement shall be effective unless made in writing and executed by both Seller and Purchaser. In the event any approval or consent is required pursuant to any provision of this Agreement, such approval or consent shall be deemed given only if it is in writing, executed b the party whose approval or consent is required.

(o) **Further Documents**. Both parties shall execute such documents hereafter from time to time as may be required to carry out the respective obligations of the parties hereunder.

(p) **Authority**. The person signing this Excess Water Use Agreement on behalf of the Town, has been duly authorized to do so and all terms and conditions have been approved pursuant to all local ordinances and the laws of the State of Utah.

(q) **Term and Renewal**. This Excess Water Use Agreement, unless otherwise terminated, shall be for a period of ten (10) years, with the right of Company to renew upon the

same terms and conditions (without payment of new Execution Fee or Option Fee) for up to two (2) separate ten (10) year renewal terms.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on this 27 day of JUNE, 2007.

Alton Coal Company

By: _____

Its: MANAGER

Alton Town, Inc.

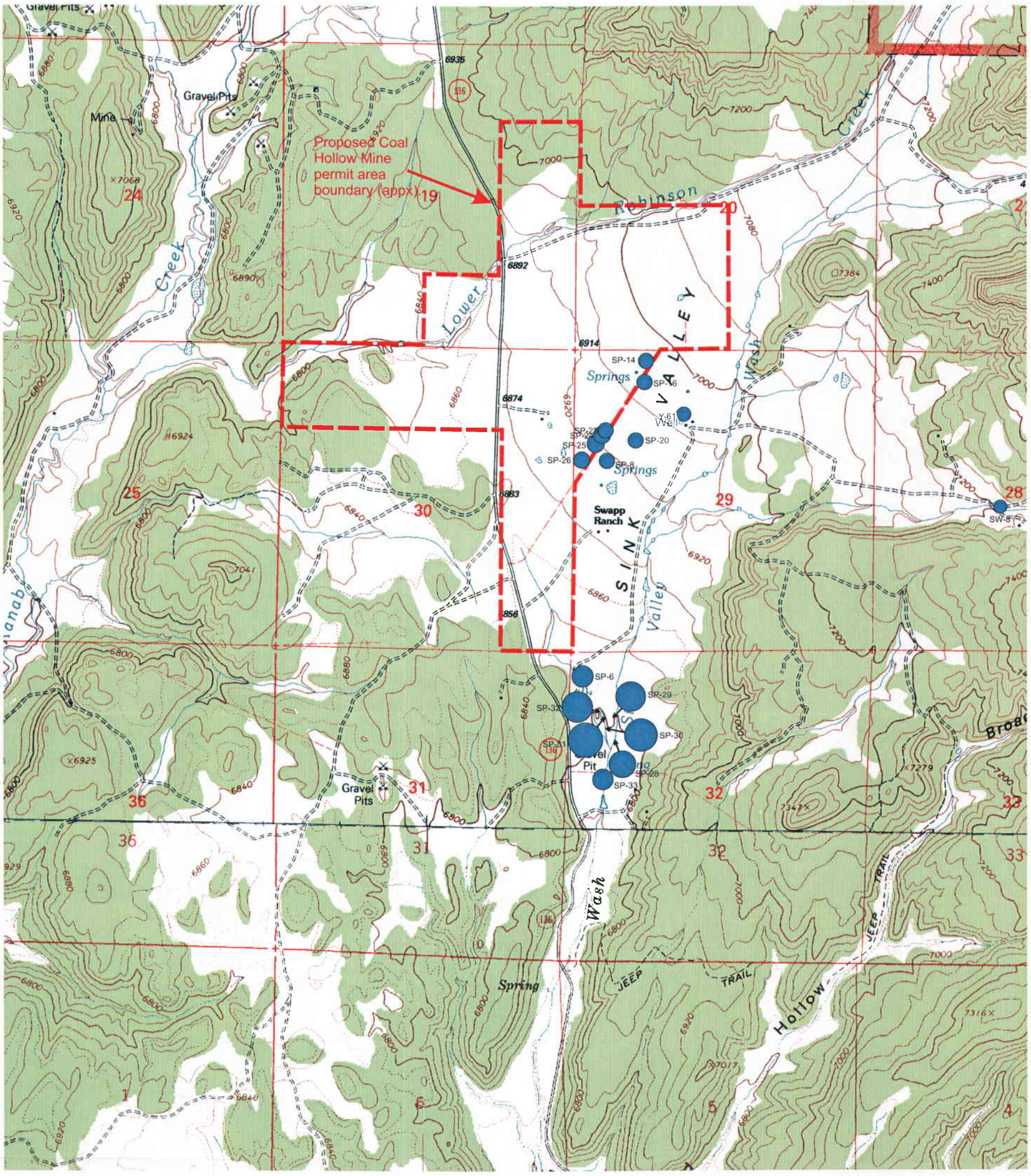
By: _____

Its: Mayor

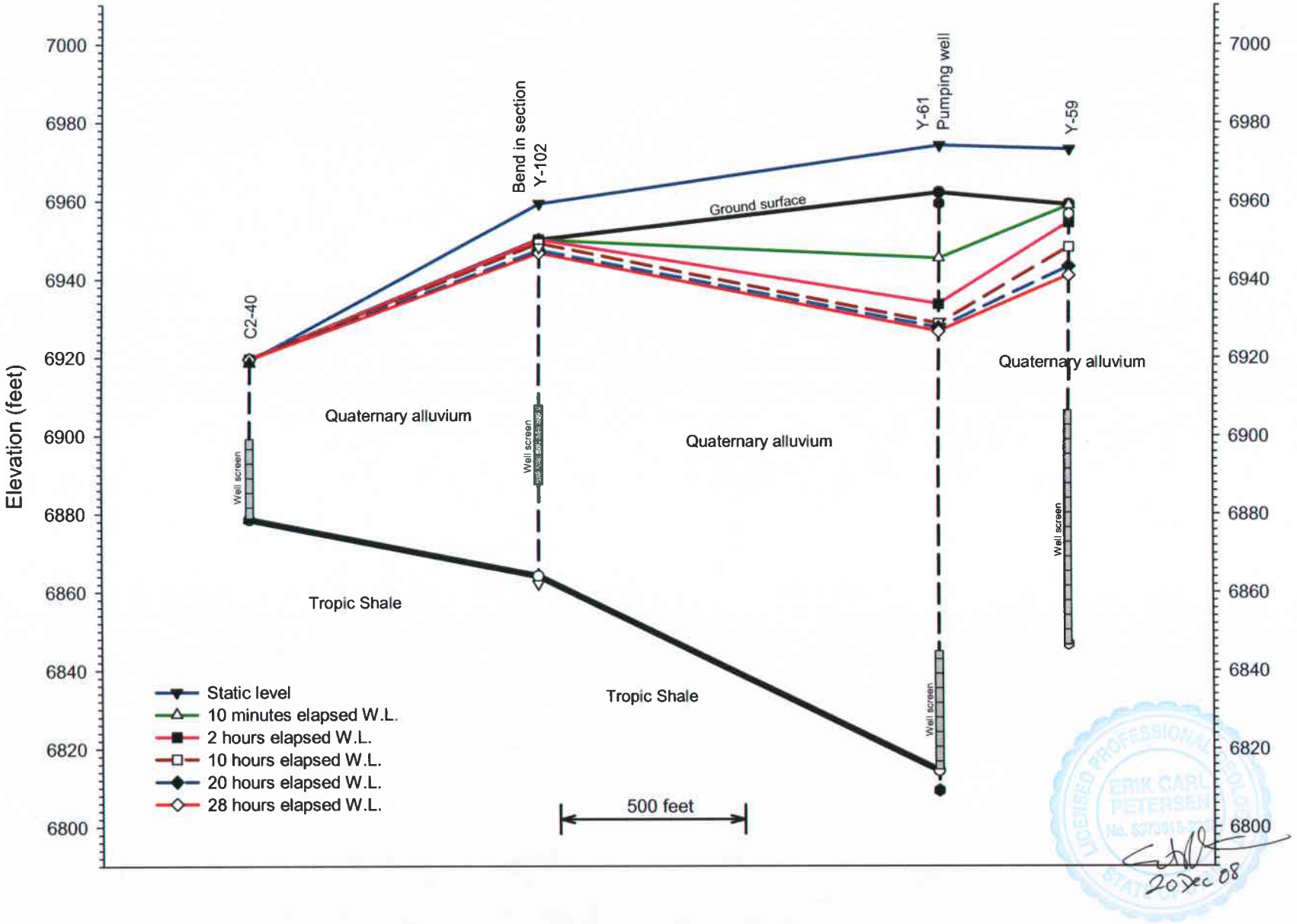
Insertion instructions

Drawings 7-1, 7-2, 7-3, 7-10, and 7-12 are to be replaced with the new versions provided.

New Drawings 7-5 and 7-6 are being added to Chapter 7 at this time.



Drawing 7-5 Map of specific conductance of alluvial groundwater in Sink Valley.



Drawing 7-14 Water levels in pumping and observation wells for January 2007 Y-61 pump test.
See Drawing 7-12 for well locations.

Instructions:

The cover and signature pages, the Table of Contents, and Page 1 of Appendix 7-7 replace the previous versions.

Supplemental Information for Utah Division of Oil, Gas and Mining Alluvial Valley Floor Finding for the Proposed Coal Hollow Mine

15 December 2008

Alton Coal Development, LLC
Cedar City, Utah

PETERSEN HYDROLOGIC, LLC
CONSULTANTS IN HYDROGEOLOGY

Supplemental Information for Utah Division of Oil, Gas and Mining Alluvial Valley Floor Finding for the Proposed Coal Hollow Mine

15 December 2008

Alton Coal Development, LLC
Cedar City, Utah

Prepared by:

Erik C. Petersen, P.G.
Senior Hydrogeologist
Utah P.G. No. 5373615-2250

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Supplemental Information for
Utah Division of Oil, Gas and Mining
Alluvial Valley Floor Finding for the
Proposed Coal Hollow Mine

1.0 Introduction

Alton Coal Development, LLC has made an application for a Utah State coal mining permit from the Utah Division of Oil, Gas and Mining (Division) to mine coal at the proposed Coal Hollow Mine permit area. The proposed Coal Hollow Mine permit area is located on private lands in the Alton Coal Field of south-central Utah, approximately three miles south of the town of Alton, Utah (Figure 1).

In its 27 August 2007 Administrative Completeness Review and 4 August 2008 Technical Review, the Division requested more information from Alton Coal Development, LLC to make alluvial valley floor findings for the permit and adjacent areas. The purpose of this document is to provide the additional information requested by the Division.

This document is organized according to the R645 Rules cited by the Division as the basis for the information request. The information requested by the Division is presented in the following sections of this document.

Instructions:

Remove Page 31 of Appendix 7-7 in the previous submittal.

Replace with new pages 31 through 39 (these are new report pages with additional information for the submittal).

7.0 R645-302-321-260

7.1 Aerial photographs and infrared imagery

Aerial photographs of the Coal Hollow Project and adjacent area are provided in Plates 3 and 4. The late summer/fall infrared imagery has been analyzed extensively in the analysis of the valley floor in Sink Valley. The infrared imagery has been utilized by researchers in each of the various scientific disciplines and was an important investigative tool in developing the conclusions presented in this report

8.0 Supplemental AVF Information for Adjacent Areas

In its 4 August 2008 technical review of the Coal Hollow Mine permit application, the Division of Oil, Gas and Mining suggested that alluvial valley floors are present to the west of the permit area along Kanab Creek, and to the south of the area in lower Sink Valley Wash. Supplemental information is provided in this section to assist the Division in making a determination regarding the presence or absence of alluvial valley floors in these areas. The supplemental information for the Kanab Creek and lower Sink Valley Wash probable AVF areas are presented separately below.

8.1 Kanab Creek probable AVF area

8.1.1 Mapping the extent of probable AVF

An area of probable alluvial valley floor has been delineated in the Kanab Creek drainage west of the Coal Hollow Mine permit area as shown in Plate 5. The probable AVF encompasses portions of Section 24, 25, 26, 35, and 36, T39S, R6W. The area consists predominantly of relatively flat fields situated on benches adjacent to Kanab Creek. The land has been used historically for hay production and for cattle grazing. Irrigation of these lands is performed exclusively using surface water diverted from Kanab Creek. The water is

diverted from the creek into ditches that convey water into irrigation holding ponds as shown on Plate 5. Water from the ponds is conveyed to the fields and applied using sub-ditches, berms, and dikes (not shown on Plate 5).

In reconnaissance-level surveys of the alluvial sediments in the Kanab Creek stream banks adjacent to the probable AVF, stream channel deposits have been identified. The lateral extents of the stream channel deposits in the subsurface in locations further away from the Kanab Creek stream channel are not known. The land surface in the area has the appearance of containing flood plains and terraces. Subirrigation of the flood-irrigated fields is not readily apparent.

8.1.2 Land productivity

Based on vegetative investigations and conversations with landowners and land managers in the Kanab Creek probable AVF area, productivity information for the Kanab Creek probable AVF area lands are provided here. The landowners and managers contacted include Mrs. Lorene Lamb, Mr. Brigham Johnson, and Mr. Brian Lamb.

The agricultural fields in the Kanab Creek probable AVF area are currently used primarily for livestock grazing (personal communications, Brigham Johnson, Brian Lamb, 2008). The lands are irrigated when sufficient water for irrigation activities is available in Kanab Creek. Typically, water for irrigation has been available in the spring and early summer only. Historically, alfalfa and grass hay has been produced on these lands. However, no hay production has occurred in the Kanab Creek probable AVF in the past seven years because there has not been sufficient water for irrigation (personal communication, Brigham Johnson and Brian Lamb, 2008). Mr. Johnson and Mr. Lamb both indicated their belief that the decrease in water availability in Kanab Creek is largely because of changes in the irrigation practices of upstream Kanab Creek water users. They suggested that much of the water that previously flowed to their Kanab Creek diversions during the irrigation season was derived from flood irrigation return flows from upstream irrigated lands. When the upstream irrigated lands transitioned from flood irrigation to sprinkler irrigation techniques, the

irrigation return flows were diminished. Consequently, because of the inadequate water supply currently available for irrigation, hay production and cutting is not occurring presently.

When the lands in the Kanab Creek probable AVF were utilized for hay production, the quantity of hay produced on the lands was largely a function of the water availability in Kanab Creek. Mr. Johnson indicated that in the approximately 100 acre hay field he worked in the northern portion of the Kanab Creek probable AVF area, a crop of approximately 75 tons was produced in the single cutting. This equates with a production of 1,500 pounds per acre for the early season alfalfa. For the fields of the southern portion of the probable AVF, Mr. Lamb provided a rough estimate of production at about 94 to 113 tons per cutting on fields of roughly similar size. This equates with a production of approximately 1,880 to 2,260 pounds per acre, which is a somewhat higher estimate than that provided for the northern field. Mr. Lamb also indicated that they were sometimes able to get two hay cuttings per year during wet years when adequate water in Kanab Creek was available for irrigation. During the years that hay cutting was occurring on these lands, the fields were commonly also used as pastures for livestock grazing for part of the year after the hay crop was harvested. Production from the pasture lands during the growing season after the hay cutting had occurred may have yielded perhaps an additional 800 to 1,000 pounds per acre (personal communication, Patrick Collins, 2008). It should be noted that the estimates of hay production by both Mr. Johnson and Mr. Lamb were based on recollection from memory and should be considered as approximate values.

In recent years, when sufficient soil moisture for hay production was unavailable through normal precipitation patterns, the fields were irrigated to increase the vegetative production of the pasture land, which is currently dominated by pasture grasses. In dryer years, lesser or no irrigation of the pastures has occurred. Productivity information for various vegetative types in the Coal Hollow Project area is provided in Section 321.200, Table 3-34 of the Coal Hollow Mine MRP. As indicated in Table 3-34, the productivity of unirrigated pasture in the area is about 1,100 pounds per acre. The productivity of pasture lands with limited irrigation

in the area is probably about 2,100 pounds per acre (personal communication, Patrick Collins, 2008).

8.1.3 Potential for impacts to the Kanab Creek probable AVF

Proposed mining and reclamation activities at the Coal Hollow Mine will not cause or present and unacceptable risk of causing material damage to the quantity or quality of surface or groundwater that supplies the lower Sink Valley Wash probable AVF.

The water source for the Kanab Creek probable AVF is surface water from Kanab Creek. As described in the Coal Hollow Mine MRP, the Kanab Creek stream channel and adjacent valley bottom will not be disturbed by mining and reclamation activities at the proposed Coal Hollow Mine. The recharge areas for Kanab Creek are located considerable distances upstream of the mining area and will likewise not be disturbed or impacted by mining-related activities at the Coal Hollow Mine. Consequently, the potential for mining and reclamation activities to cause material damage to the quantity or quality of the water supply for the Kanab Creek probable AVF is essentially nonexistent.

It should be noted that there are no irrigation diversions from Lower Robinson Creek to the Kanab Creek probable AVF and water from Lower Robinson Creek is not a supply to the probable AVF. The discharge in Lower Sink Valley (as monitored at site SW-5; DOGM 2007) is usually meager and not sufficient for appreciable irrigation of the lands in the Kanab Creek probable AVF. Appreciable discharge in the drainage occurs only during the snowmelt event and in direct response to torrential rainfall events. As indicated in the statement of probable hydrologic consequences for the Coal Hollow Mine (see section 728 of Chapter 7 of the Coal Hollow Mine MRP) adverse impacts to groundwater or surface water availability and to water quality in the Lower Robinson Creek drainage are considered unlikely.

The rate at which alluvial groundwater will be intercepted by the proposed Coal Hollow Mine will be variable by location and time in permit area. Because of the heterogeneity

inherent in most alluvial deposits, the quantifying of precise aquifer parameters in the various mining areas is not straightforward. Additionally, the geometry of the mine openings including the horizontal lengths and heights of mine pit faces adjacent to saturated groundwater systems that are exposed at any point in time are dynamic variables in the surface mining environment. Consequently, precise quantifications of mine groundwater interception rates are not readily obtainable. However, using the estimated mine pit groundwater inflow rates presented as discharge per linear foot of open pit in Table 7-9 of Chapter 7 of the Coal Hollow Mine MRP, it is considered likely that mine interception will be on the order of a few tens of gallons per minute in dry areas and at times when open pit sizes are small, to several hundred gallons per minute in wetter areas and at times when the open pit size is large. It is important to note that inflows into individual pit areas will be short lived, as the individual pits will commonly remain open for a few weeks to a few months.

As described above, the quantity of water currently used for flood irrigation in the Kanab Creek probable AVF area is highly variable. During wet years, several applications of flood irrigation water may be applied to all or portions of the irrigated fields. During dry years, little or no irrigation of the lands may occur. As an order of magnitude estimate, using the monthly water requirements for alfalfa and pasture lands in the Alton area in Table 8, it is calculated that to fully irrigate 200 acres of land for pasture or alfalfa would require about 305 and 370 acre-feet of irrigation water per year for pasture and alfalfa production, respectively (assuming a typical precipitation during the growing season of 5 inches). This equates with an average continuous usage of about 190 and 240 gpm for pasture land and alfalfa land, respectively (averaged over the entire year). This approximation represents a maximum usage when all lands are irrigated and ample irrigation water is present. When water availability is lower, the amount of water usage will, accordingly, be lower and less acreage could be irrigated or fewer irrigation applications could be applied.

It is important to note that the above provided estimates of water usage at the Kanab Creek probable AVF represent water diverted exclusively from Kanab Creek. None of the water

utilized for irrigation of the Kanab Creek probable AVF area is derived from or transits through the proposed Coal Hollow Mine permit area.

8.2 Lower Sink Valley Wash probable AVF area

8.2.1 Mapping the extent of probable AVF

An area of probable alluvial valley floor has been delineated in the lower Sink Valley Wash area south of the Coal Hollow Mine permit area as shown in Plate 5. The mapped probable AVF encompasses portions of Sections 5 and 6, T40S, R5W. Similar valley features extend further down Sink Valley Wash below the area delineated in Plate 5, but these are not evaluated herein. The land in the lower Sink Valley Wash probable AVF area consists predominantly of relatively flat or gently sloping lands situated on a bench adjacent to the deeply incised (>20 feet) lower Sink Valley Wash stream channel (Plate 5). The land surface in the lower Sink Valley Wash probable AVF area is vegetated mostly with grasses and sagebrush. It was apparent in field reconnaissance that the land in this area has been used primarily for livestock grazing on undeveloped range land. There was no indication that flood irrigation or appreciable crop production has occurred in this area in the recent past. The Sink Valley Wash stream channel in this area is incised by more than 20 feet below the surrounding land surface. Surface-water monitoring at site SW-9 on Sink Valley Wash within the probable AVF area indicates the scarcity of water in the drainage. On only two of the 17 monitoring events at SW-9 from June 2005 to August 2008 was any water present in the drainage (see UDOGM hydrology database, 2008). During March 2006, a flow of 10.6 gpm was measured. During March 2008, a flow of 182 gpm was measured.

In reconnaissance-level surveys of the alluvial sediments in the lower Sink Valley Wash steam banks adjacent to the probable AVF, stream channel deposits have been identified. The lateral extents of the stream channel deposits in the subsurface at locations further away from the Sink Valley Wash stream channel are not known. The land surface in the area has the appearance of containing flood plains.

It is notable that there is a marked change in the geomorphology of the alluvial sediments in lower Sink Valley Wash that occurs near the County Road 136 crossing of Sink Valley Wash in Section 5, T40S, R5W (Plate 5). The Sink Valley Wash canyon bottom above the county road crossing is characterized by a narrow-bottomed valley with only a minor associated alluvial system and discontinuous stream channels. Below the county road crossing, the channel widens significantly, a flood plain becomes apparent, and stream channel deposits are visible in stream banks.

The area designated as probable AVF in lower Sink Valley Wash on Plate 5 is so designated based on several observed valley characteristics that are consist with the definition of probable alluvial valley floors. Namely, 1) it is a topographic valley holding a continuous stream channel, 2) there is the probable existence of stream laid deposits in the subsurface, and 3) the land area appears capable of being flood irrigated based on topography. However, the absence of any reasonable source of water that could be used to irrigate the valley floor or used for subirrigation seems to limit its potential for current or future agricultural activity.

8.2.2 Land Productivity

The land surface in the lower Sink Valley Wash AVF area is dominated by sagebrush and grass vegetation. Under normal conditions, the annual biomass productivity of the lower Sink Valley bottomlands that are dominated by basin big sagebrush, rubber rabbitbrush plant communities and have loamy soils have been estimated at 1,500 pounds per acre (USDA, 1990).

8.2.3 Potential for impacts to the lower Sink Valley Wash probable AVF

Proposed mining and reclamation activities will not cause or present and unacceptable risk of causing material damage to the quantity or quality of surface or groundwater that supplies the lower Sink Valley Wash probable AVF. Currently, there is no reasonably dependable water source for irrigation or subirrigation activities at the lower Sink Valley Wash probable AVF. Because there is no appreciable baseflow discharge component to the wash, the limited water

that is available periodically is derived from rainfall or snowmelt runoff water. The potential for adverse impacts to water quantity or water quality in the lower Sink Valley Wash area as a result of mining and reclamation activities at the Coal Hollow Mine is considered very low (see section 728.334 of the Coal Hollow Mine MRP).

The volume of water currently used in the lower Sink Valley probable AVF for irrigation or subirrigation is zero. As described above, there is very little water available in the drainage that could potentially be used for irrigation.

The proposed mining and reclamation activities will not discontinue or preclude farming at the lower Sink Valley Wash probable AVF. Currently, no farming operations are present in this probable AVF. No irrigation of the lands in the lower Sink Valley probably AVF is presently occurring, nor is subirrigation of these lands apparent. As stated above, adverse impacts to water quantity or quality in lower Sink Valley Wash are not anticipated. Consequently, the potential for discontinuing or precluding farming at the lower Sink Valley Wash probable AVF is considered remote.

As discussed in Section 8.1.3 above, the rate of interception of alluvial groundwater by the Coal Hollow Mine is anticipated to be on the order of a few tens of gallons per minute in dry portions of the mine and when the exposed mine pit area is small, to several hundreds of gallons per minute in wet areas and when the exposed pit areas are large. Based on reconnaissance investigations in the lower Sink Valley Wash probable AVF area, there appears to have been no water utilized there for irrigation in the recent past.

9.0 Seasonal Variability and Depth to Water Information

As requested by the Division, additional information regarding seasonal variability in groundwater systems in the Coal Hollow Mine permit and surrounding areas is provided herein. A map showing seasonal variation in wells in the alluvial groundwater systems is

provided as Figure 14. A map showing typical depths to groundwater below the land surface in alluvial wells in the permit and surrounding area is provided as Figure 13.

10.0 References Cited

Hill, R. W. and Heaton, K, 2001, Sprinklers, Crop Water Use, and Irrigation Time, Kane County, Utah State University Extension, ENGR/BIE/WM/11.

OSM, 1983, Alluvial valley floor identification and study guidelines, U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement.

Personal communication, Lorene Lamb, Orderville, Utah, December 2008, Landowner in the Kanab Creek probable AVF area.

Personal communication, Brigham Johnson, St. George, Utah, December 2008, Agricultural manager in the Kanab Creek probable AVF area.

Personal communication, Brian Lamb, Mount Carmel, Utah, December 2008, Agricultural manager in the Kanab Creek probable AVF area.

UDOGM, 2007, Utah Division of Oil, Gas and Mining, Utah coal mine water quality database, on-line at http://ogm.utah.gov/coal/edi/wqdb.htm.

USDA, 1990, Soil survey of Panguitch area, part of Garfield, Iron, Kane and Piute Counties, SCS (NRCS).

Instructions:

Add Figures 13 and 14 to the figures in Appendix 7-7

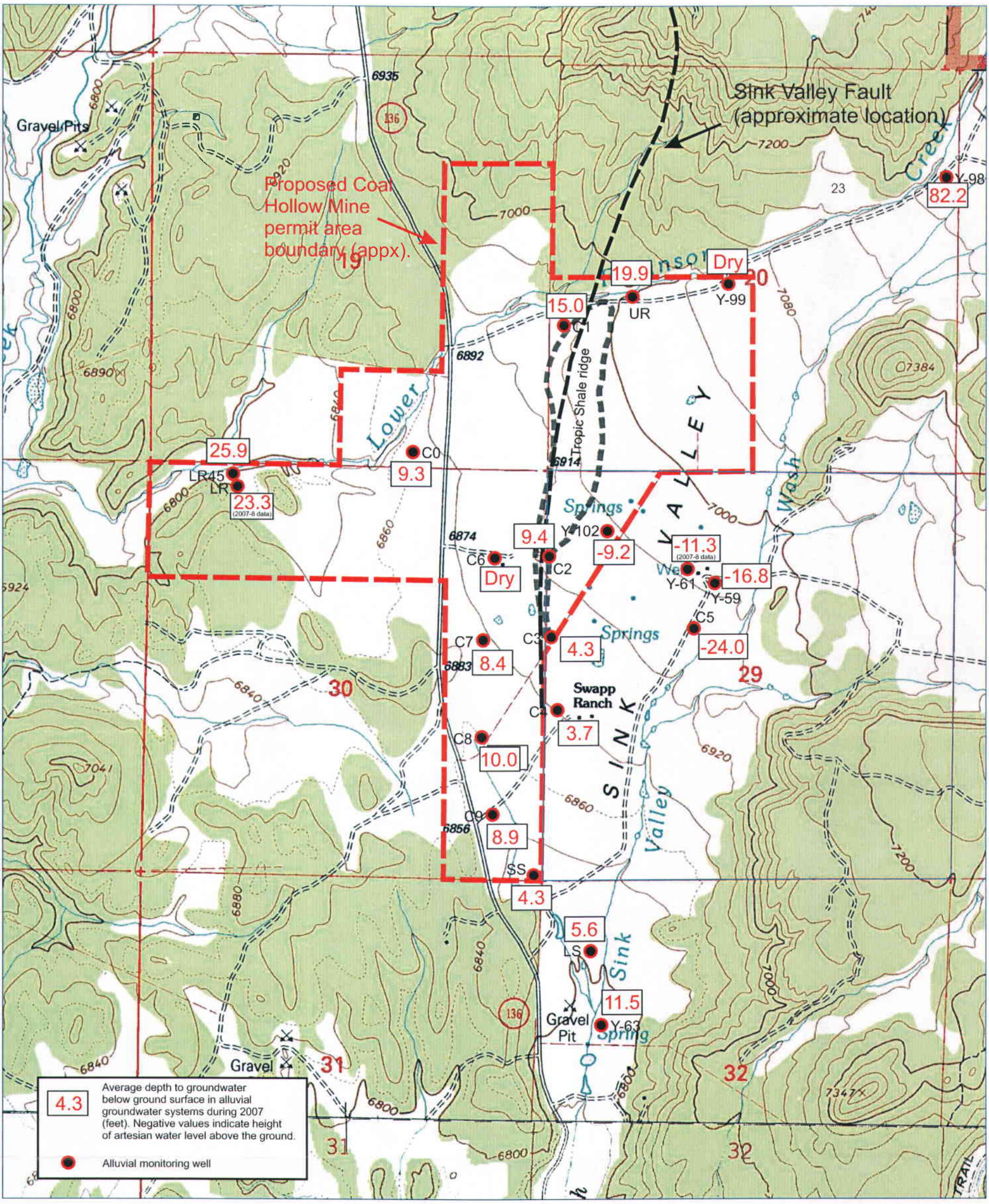


Figure 13 Average depths to groundwater relative to ground surface in the alluvial groundwater systems in the Coal Hollow Mine permit and surrounding area during 2007.

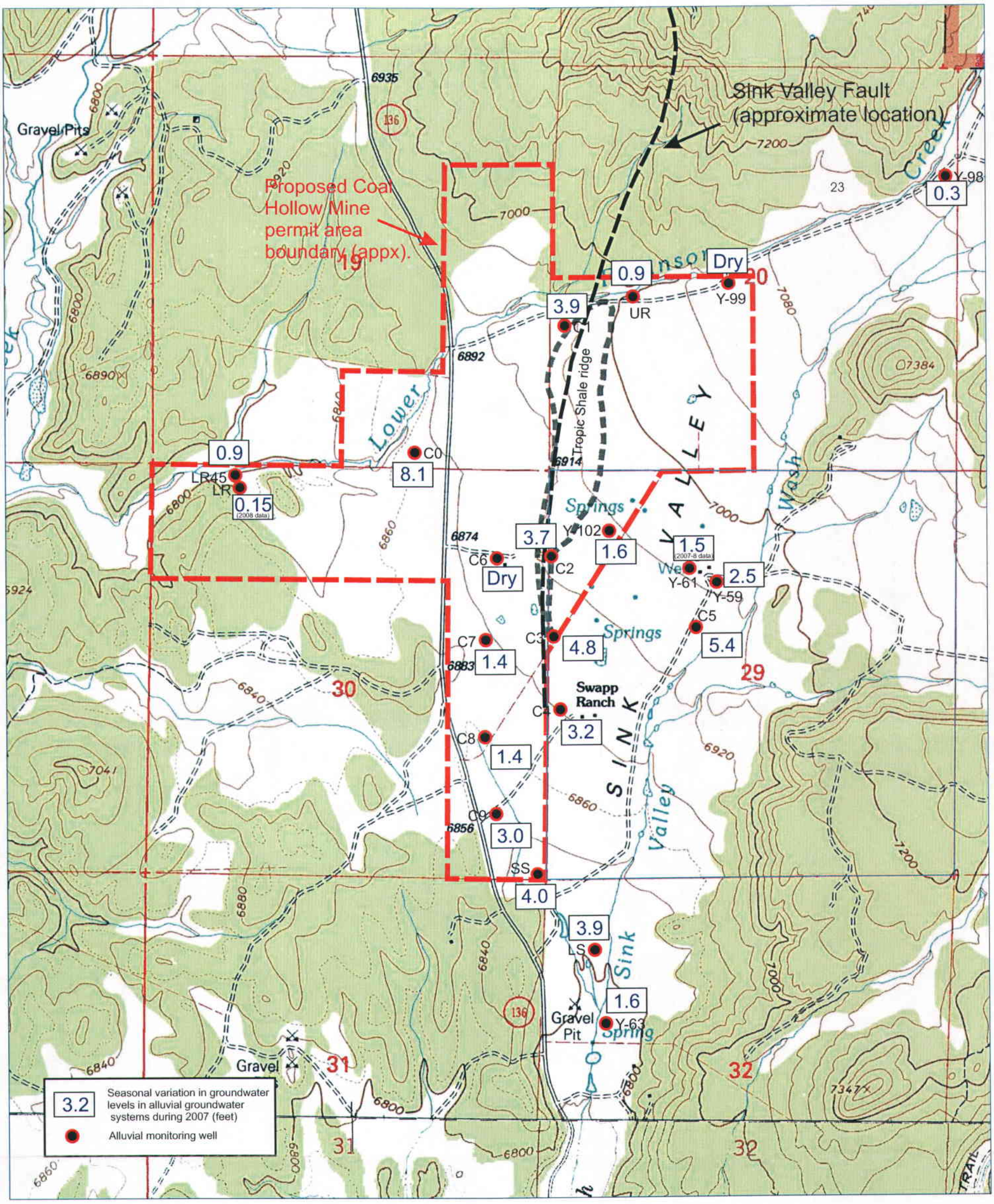


Figure 14 Seasonal variation in groundwater levels in the alluvial groundwater systems in the Coal Hollow Mine permit and surrounding area during 2007.

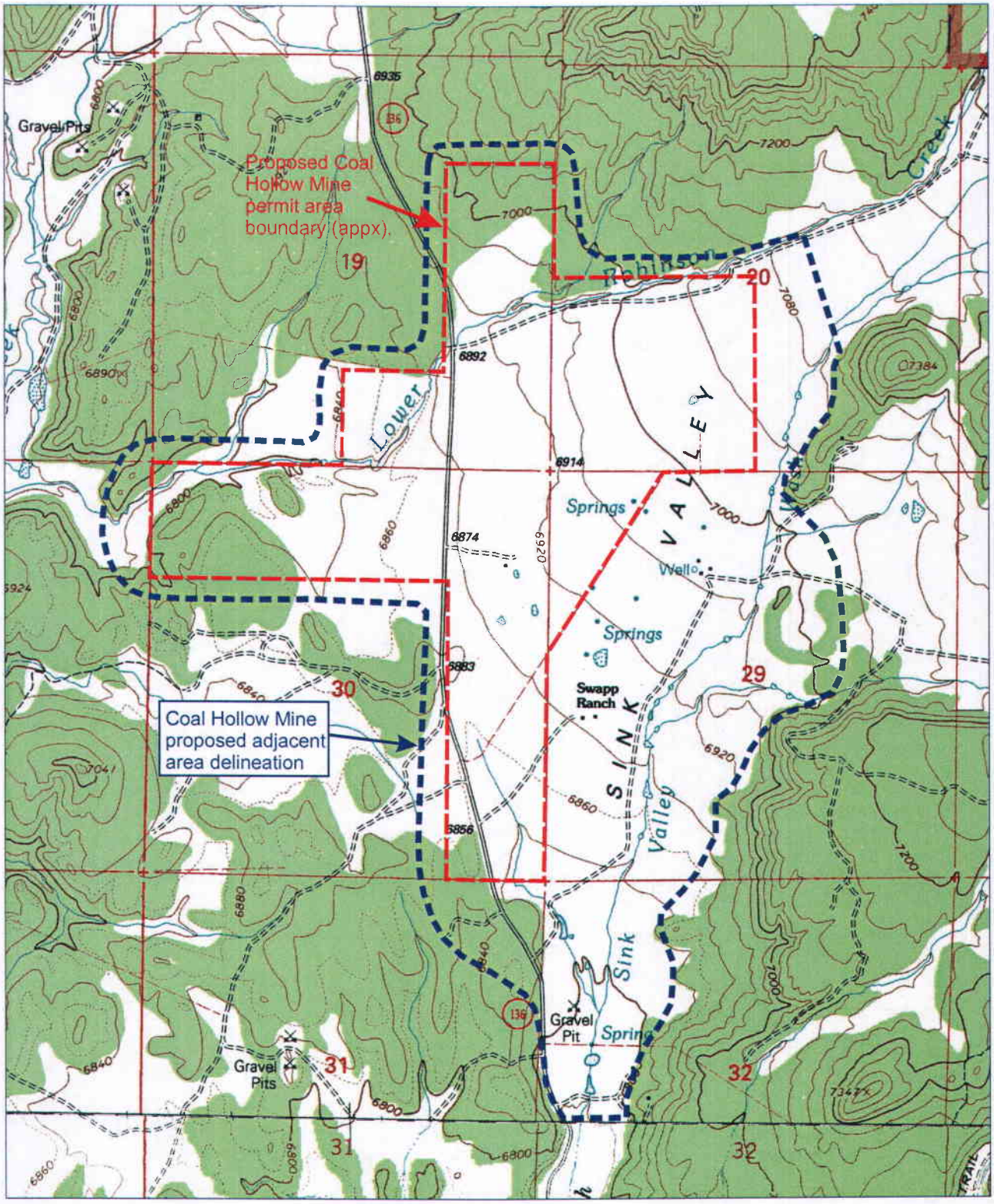
Insertion Instructions:

The existing Plate 3 and Plate 4 of Appendix 7-7 are being replaced with the new Plates 3 and 4 provided.

Plate 5 is a new addition to Appendix 7-7.

Insertion instructions

This drawing is not provided in response to a Division deficiency. The map is provided in response to a verbal request by Division staff to provide a proposed delineation of the adjacent area for the Coal Hollow Mine.



Coal Hollow Mine proposed "Adjacent Area" delineation.
The affected area is the overall disturbance shown on Drawing 5-1.